A RESOURCE MANAGEMENT PLAN

FOR

The Sustainable Harvest Strategic Objective

IN THE

PRINCE GEORGE FOREST REGION

2001 - 2005

Ministry of Forests

Ministry of Environment,
Lands & Parks

IN PARTNERSHIP WITH

FOREST
RENEWAL BC

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1 Prince George Forest District

1.1 Basic Data

1.1.1 Land Area:

Total area of Crown Forest Land in the Prince George Forest District is 3,010,784 hectares. (*Note: not adjusted for new protected areas and Park expansions*)

1.1.2 Annual Allowable Cut (AAC):

Current AAC, for all tenures in this District is 4,884,170 cubic metres.

1.1.3 Current Harvest Forecast:

Approximately 16,000 hectares per year.

1.1.4 Site Class Profile:

Ranges from good to poor site class. Most harvesting occurs on medium and good sites

1.1.5 Age Class Profile:

Harvesting is concentrated in over-mature stands (age class 7, 8 and 9). Some harvesting does occur in age class 5 and 6 lodgepole pine stands.

1.1.6 Tree Species Profile:

Predominately mixed conifer stands, with spruce-balsam, and lodgepole pine-spruce being the most common mix. Lesser components of Douglas fir, western red cedar, and western hemlock are also harvested. Minor harvesting of deciduous trees is occurring, subject to market conditions.

1.2 Issues

A fall-down effect is predicted when over-mature stands are liquidated. Mid-range age classes are deficient, while younger age classes plentiful.

1.3 Incremental Silviculture History

Silviculture treatments in this District have predominantly been focused on basic reforestation and maintenance on harvested sites. FRDA and Social programs over the past 20 years have provided funding for incremental treatment such as juvenile spacing, and to a lesser extent pruning and fertilization, where the opportunity existed. Most of those opportunities have now been addressed, and current and near-future work is being focused on tending of pre-1987 plantations, and reforestation of backlog NSR.

1.4 Opportunities to Increase Timber Supply

The best opportunity for increase in timber supply is to reforest backlog NSR sites. Lesser gains can also be made by tending backlog plantations where growth is impeded by deciduous tree competition.

1.4.1 Potential Treatments and Treatable Area Information

Primary treatments will be stand tending of backlog plantations, where need and opportunity are identified through current surveys. Treatable NSR sites will also be a high priority to reforest.

Approximately 350,000 hectares of pre-1987 harvested area has been reforested in this District. Surveys continue to be carried out over this area on a methodical basis, to identify tending opportunities.

1.4.2 Potential Strategies by Response Time Frame

1.4.2.1 Short Term:

Very little can be accomplished through silviculture strategy which would increase AAC in the short term.

1.4.2.2 Medium Term:

Juvenile spacing of dense stands of immature conifers can shorten time period required to reach merchantable sawlog size requirements. Most opportunities in immature lodgepole pine stands have already been addressed, so in the near future those opportunities will be limited..

1.4.2.3 Long Term:

Reforest all treatable NSR on good and medium sites and tend all plantations which are impeded.

1.5 Opportunities to Improve Timber Quality

Very little opportunity exists in this District. Pruning treatments would not show a positive economic return from the stands which are available. Juvenile spacing treatments will created larger diameter stands and thus better sawlogs in a shorter time period.

1.5.1 Potential Treatments

Pruning for clear wood. Juvenile spacing for better sawlog size.

1.5.2 Potential Strategies by Response Time Frame

1.5.2.1 Short Term

Nil

1.5.2.2 Medium Term

Nil

1.5.2.3 Long Term

Juvenile spacing of dense stands, to encourage larger diameter growth. Pruning may be considered but is generally uneconomic in this area and in the stands present.

1.5.3 Timber Quality Forecast Scenarios

N/A

1.6 Habitat Supply

1.6.1 Specific issues:

Ungulate winter range and general browse supply is the primary concern on upland areas. Riparian cover and protection on streams and wetlands is also an issue.

Magnitude and expanse of monocultures and homogenous areas is also of concern.

1.6.2 Opportunities to mitigate:

Backlog silviculture operations are carried out with considerations for the habitat concerns. Prescriptions are prepared and are approved for each treatment project, and habitat issues are addressed in concert with a District standard operating procedure which was prepared as a joint effort by Ministries of Forests and Environment.

1.6.3 Geographic areas:

None specifically.

1.6.4 Opportunities within existing strategies and guidelines:

N/A

1.7 Working Targets

N/A

1.8 Incremental Silviculture Program

In order of priority, the following activities will be carried out: reforestation of NSR good and medium sites; brushing of impeded plantations; juvenile space over-dense immature conifer stands; fertilizing of immature stands, where nutrient deficiency exists.

1.9 Job Outcomes

A large portion of the stand tending program is carried out through manual methods which are very labour intensive. A shift to a higher proportion of herbicide treatments may be in order - to ensure better efficacy of treatment, and to allow for higher timber supply gains with a fixed or reduced budget.

1.10 References

1.11 DPG Standard RMP Summary Tables

1.11.1 Backlog Activities (Table A)

	Plan Goals (hectares)					2000/01		
	2000/2001	2001/02	2002/03	2003/04	2004/05	Funding ($000)	Average Unit Cost $	Priority[1]
Legal Obligations								
Planning/surveys/prescriptions	200	200	200	200	200	5,000	25	2
Site preparation	0	0	0	0	0	0	0	9
Planting	50	50	50	50	50	22,500	450	1
Brushing	100	100	100	100	100	65,000	650	1
Seed Purchase[2]	75	75	75	75	75	17,500	233	1
Backlog Reforestation[3]								
Planning/surveys/prescriptions	7,000	6,000	6,000	6,000	6,000	210,000	30	1
Site preparation	500	500	500	500	500	400,000	800	1
Site Restoration Road/land. rehab	50	50	50	50	50	40,000	800	2
Planting	800	800	800	800	800	448,000	560	1
Brushing	500	500	500	500	500	300,000	600	1
Seed Purchase[2]	1,000	1,000	1,000	1,000	1,000	250,000	250	1
Impeded areas								
Planning/surveys/prescriptions	8,000	8,000	8,000	8,000	8,000	360,000	45	1
Site preparation	0	0	0	0	0	0	0	9
Planting	0	0	0	0	0	0	0	9
Brushing	4,000	4,000	4,000	4,000	4,000	3,150,000	788	1
Seed Purchase[2]	0	0	0	0	0	0	0	9
Backlog Activities - Management Unit Total								
Planning/surveys/prescriptions	15,200	11,200	10,200	10,200	10,200	575,000	38	
Site preparation	500	500	500	500	500	400,000	800	
Planting	850	850	850	850	850	470,500	554	
Brushing	4,600	4,600	4,510	4,600	4,600	3,515,000	764	
Seed Purchase[1]	1,075	1,075	1,075	1,075	1,075	267,500	249	
Studies[4]	0	0	0	0	0	0	0	9

Notes:

Priority rating: Rate High=1&2, Medium=3, Low=4&5

Seed Purchase includes purchase of A class seed and cone collection.

Include opportunities for fill planting, rehabilitation of poorly performing stands and any site rehabilitation, planting and brushing activities on roads and landings that are proposed to be restored under site restoration under the Sustainable Harvest Program.

Include specific studies that need to be done to support this program area. Clearly identify in the RMP the type of study and realistic funding needs for 2000/2001. Indicate the level of funding required for subsequent years to continue these projects (where necessary) and add new projects.

1.11.2 Stand Tending Activities (Table B)

	Plan Goals (hectares)					2000/01		
	2000/ 2001	2001/02	2002/03	2003/04	2004/05	Funding ($000)	Average Unit Cost $	Priority[1]
Planning/Surveys/prescriptions	1,000	1,000	1,000	1,000	1,000	30,000	30	3
Spacing	200	200	200	200	200	140,000	700	3
Pruning	0	0	0	0	0	0	0	9
Fertilizing	0	0	0	0	0	0	0	9
Studies[2]	5	5	5	5	5	66,000	13,200	2

Notes:

Priority rating: Rate High=1&2, Medium=3, Low=4&5. Priorities relate to meeting management objectives, timber supply/timber quality targets, and strategies for the management unit.

Include specific studies that need to be done to support this program area. Clearly identify in the RMP the type of study and realistic funding needs for 2000/2001. Indicate the level of funding required for subsequent years to continue these projects where necessary and add new projects.

1.11.3 Forest Health Enhancement Activities (Table C)

	Plan Goals (hectares)					2000/01		
	2000/2001	2001/02	2002/03	2003/04	2004/05	Funding ($000)	Average Unit Cost $	Priority[1]
Site rehab	0	0	0	0	0	0	0	9
Spacing	0	0	0	0	0	0	0	9
Pruning	0	0	0	0	0	0	0	9
Studies[2]	0	0	0	0	0	0	0	9
Others[3]	0	0	0	0	0	0	0	9

Activities included in Table C are aimed at enhancing the values of second growth stands.

To be eligible for FRBC funding, forest health enhancement activities must be consistent with two key strategic objectives:

increasing productivity and value of second growth forests; and
strengthening information for planning.

Key questions to ask with regards to forest health enhancement activities include:
will it *enhance* growth and yield?
will it *improve* our forest management practices through the gathering and sharing of better research and inventory information?
will it *promote* further understanding that will provide a sound basis for changes in practices?

Notes:
Priority rating: Rate High=1&2, Medium=3, Low=4&5

Include specific studies that need to be done to support this program area. Clearly identify in the RMP the type of study and realistic funding needs for 2000/2001. Indicate the level of funding required for subsequent years to continue these projects (where necessary) and add new projects.

Districts to define "other." Only treatments that enhance the health, volume or value of **second growth** forests are to be included.

1.11.4 Forest Health Maintenance Activities (Table D)

	Plan Goals					2000/01		
	2000/2001	2001/02	2002/03	2003/04	2004/05	Funding ($000)	Average Unit Cost $	Priority[1]
Ground Surveys (ha)	160	160	160	160	160	40,000	250	1
Aerial Surveys (hours of flying time)	60	60	60	60	60	42,000	700	1
Fall and burn treatment (trees)	2,500	2,500	2,500	2,500	2,500	162,500	65	1
MSMA treatment (trees)	0	0	0	0	0	0	0	9
Pheromone baiting (trees)	600	600	600	600	600	9,000	15	3
Defoliator spraying (ha)	0	0	0	0	0	0	0	9
Studies[2]	0	0	0	0	0	0	0	9
Other[3]	57	57	57	57	57	35,000	614	2

Activities included in Table D are primarily aimed at protecting mature timber from insects and disease (primarily the control of bark beetles and defoliators).

Even though FRBC may not fund these activities, the RMP is collecting information to identify and present funding opportunities and needs to the MoF executive.

Notes:
Priority rating: Rate High=1&2, Medium=3, Low=4&5

Include specific studies that need to be done to support this program area. Clearly identify in the RMP the type of study and realistic funding needs for 2000/2001. Indicate the level of funding required for subsequent years to continue these projects (where necessary) and add new projects.

Districts to define "other" treatments that are included.

1.11.5 Current Fire and Pest Activities (Table E)

	Plan Goals (hectares)					2000/01		
	2000/2001	2001/02	2002/03	2003/04	2004/05	Funding ($000)	Average Unit Cost $	Priority[1]
Planning/surveys/prescriptions	100	100	50	50	200	2,500	25	2
Site preparation	0	0	0	0	0	0	0	9
Planting	66	0	0	0	0	49,500	750	1
Brushing	50	30	30	0	0	32,500	650	1
Max density spacing	0	0	0	0	0	0	0	9
Studies[2]	0	0	0	0	0	0	0	9

Activities included in Table E are primarily aimed at reforesting areas impacted by current fire and pest denudation.

Even though FRBC may not fund these activities, the RMP provides funding needs and opportunities to the MoF executive.

Notes:
Priority rating: Rate High=1&2, Medium=3, Low=4&5

Include specific studies that need to be done to support this program area. Clearly identify in the RMP the type of study and realistic funding needs for 2000/2001. Indicate the level of funding required for subsequent years.

1.11.6 Habitat Supply Activities (Table F)

(Footnote Domestic Range)

	Plan Goals (hectares)					2000/01		
	2000/ 2001	2001/02	2002/03	2003/04	2004/05	Funding ($000)	Average Unit Cost $	Priority[1]
Planning/surveys/prescriptions	0	0	0	0	0	0	0	9
Site preparation	0	0	0	0	0	0	0	9
Planting	0	0	0	0	0	0	0	9
Brushing	0	0	0	0	0	0	0	9
Spacing	0	0	0	0	0	0	0	9
Pruning	0	0	0	0	0	0	0	9
Studies[2]	0	0	0	0	0	0	0	9
Others[3]	0	0	0	0	0	0	0	9

FRBC may fund habitat enhancement and domestic range management activities such as: planting of Riparian Management Zones (and Riparian Reserve Zones under the Watershed Restoration Program) with hardwoods; spacing to produce mule deer winter habitat; spacing to control tree densities on range land; or pruning to maintain forage conditions.

Even though FRBC may not fund all these activities, the RMP process is collecting complete information to identify and present funding opportunities and needs.

Notes:
Priority rating: Rate High=1&2, Medium=3, Low=4&5

Include specific studies that need to be done to support this program area. Clearly identify in the RMP the type of study and realistic funding needs for 2000/2001. Indicate the level of funding required for subsequent years.

Districts to define "other" treatments that are included. Footnote domestic range activities.

1.12 RECOMMENDED FUNDING LEVELS FOR 2000/01

Program Funding Priorities Prince George District RMP

Strategic Objective	Program	Minimum Funding Level	Optimal Funding Level	Priority 1, 2, 3, etc.	Comments
Sustainable Harvest	Backlog Silviculture	$5,328,000	$5,555,667	H	#1 - brush plantations; #2 - Plant seedlings on-line #3 - Reforest NSR (TSR Priority)
	Stand Tending	$236,000	$236,000	M	Treat areas for earlier-rotation Timber Supply benefits
	Forest Health Enhancement	N/A	N/A	N/A	Some achievements will be gained in silviculture programs
	Forest Health Maintenance	$288,000	$350,000	H	Identify pest incidence; maintain pests at endemic levels
	Current Fire And Pest	$84,500	$84,500	H	Surveys required; NSR must be replanted on Eagle Fire; brushing on 1992 fires.
	Habitat Supply	Nil	Nil	Nil	Achieved through backlog and enhanced silviculture and WRP activities
Strengthen Sustainable Forest Management	Inventories	$1,598,029	$2,000,000	M	TSR and LRMP Priorities. Includes estimated MOELP administered inventories
Enhance Environmental Values	Watershed Restoration	$1,183,645	$2,000,000	H	To identify key watersheds, and to alleviate or restore up-slope and/or fish habitat..
	Road & Bridge Maintenance	$609,000	$2,826,045	H	Safety Issue. Does not include bridge replacement
	Recreation Site and Trail Maintenance	$206,200	$243,200	H	Public safety concerns on sites and trails; public information also included.
	Total	$9,533,374	$13,295,412		

A RESOURCE MANAGEMENT PLAN

for

Forest Renewal BC Strategic Objectives

in the

ROBSON VALLEY FOREST DISTRICT

2000 – 2004

Sustainable Harvest Component

Ministry of Forests

In Partnership with

FOREST
RENEWAL BC

2 Robson Valley Forest District

This Resource Management Plan is submitted in fulfilment of conditions and obligations in the MULTI-YEAR AGREEMENT (Services) between the Ministry of Forests and Forest Renewal BC

Prepared by: (Signature)

Reviewed by: (Signature)

Approved by: (District Manager Signature)

J.D. Jeff Beale, R.P.F

2.1 Basic Data

2.1.1 Land Area:

The Robson Valley timber supply area covers an area of 1,235,821 hectares of which about 209, 365 hectares are considered to be on the timber harvesting land base, that is, available for timber harvesting under current management practices. The Robson Valley timber supply area is contained within Robson Valley Forest District which its located in east central British Columbia.

2.1.2 Annual Allowable Cut (AAC):

On April 2, 1996, the chief forester set the allowable annual cut at 602,377 cubic metres. This decision maintained the previous allowable annual cut of 600,000 cubic metres, less a 3,623 cubic metre allocation for woodlot licenses which are managed separately from the timber supply area, plus a 6,000 cubic metre partition for deciduous species.

2.1.3 Current Harvest Forecast:

The 1994 timber supply review, upon which the AAC determination was based, shows the allowable annual cut can be maintained for 10 years without causing a reduction in future harvest levels below the long-term level. After 10 years the harvest declines at 10% each decade until the long term is reached in the sixth decade. The long-term harvest level, the potential maximum that can be harvested in perpetuity, is about 351,000 cubic metres per year, a 41 % decline from the initial harvest level.

The Ministry of Forests is presently conducting a new timber supply review in Robson Valley timber supply area. The analysis report will be released in the fall of 1999, and the allowable annual cut determination will be released in the spring of 2000.

2.1.4 Site Class Profile:

The site quality of the timber harvesting land base is classified as 54 % poor, 30 % medium and 16 % good.

2.1.5 Age Class Profile:

The age class profile of the timber harvesting land base is skewed toward old age classes. Over 70 % of the stands are 100 years of age or older, and 60% of the stands are 200 years of age or older.

2.1.6 Tree Species Profile:

The tree species profile on the timber harvesting land base is approximately 45 % spruce, 19 % sub-alpine fir, 13 % lodgepole pine, 10 % western red cedar, 8 % western hemlock, and 5 % Douglas-fir. Spruce stands over 100 years of age account for more than 33 % of the timber harvesting land base.

2.2 Issues

2.2.1 Timber quantity

The timber supply is declining. The most important factor is the abundance of old growth timber that has allowed harvesting above the long-term harvest level. The regenerating stands will be harvested at a younger age and smaller size than the old growth stands, and there will be less timber volume available to harvest. Forest cover requirements for other resources such as wildlife habitat and visual quality also limit timber harvesting.

Sensitivity analyses performed for the 1994 timber supply review indicated that the short-term timber supply is very sensitive to changes in volumes of existing stands. Even moderate changes in assumptions resulted in initial harvests more than 40% lower than the base case or conversely, the initial harvest level being maintained for 3 decades.

Uncertainties about minimum harvestable ages, green-up requirements, and visual quality objectives have moderate impacts on short-term harvest levels, while uncertainty about regenerated yields has a moderate impact on long term harvest level. A level 2 strategic silviculture analysis planned for the 1999/2000 fiscal year will model applying incremental silviculture practices to increase timber supply.

2.2.2 Timber quality

No studies on timber quality have been completed for Robson Valley District and no information on timber quality is available from the 1994 timber supply review so it is not possible to prepare a timber quality strategy as part of this plan. A level 2 strategic silviculture analysis could be used to model opportunities to use incremental silviculture practices to influence timber quality.

2.2.3 Habitat supply

No studies relating habitat supply and timber supply have been conducted. However, in the 1997 timber supply review data package, all high quality caribou habitat is excluded from the timber harvesting land base, and medium and corridor habitat areas are subject to forest cover requirements. Also, for grizzly bear habitat, buffers along certain avalanche paths are excluded from timber harvesting.

2.3 Incremental Silviculture History

Incremental silviculture treatments, primarily juvenile spacing, have been applied to only a few openings that account for a total of about 1.2 % of the managed forest. Incremental silviculture has not been included in the basis for the most recent allowable annual cut determination.

2.4 Opportunities to Increase Timber Supply

The interim provincial strategic objectives for timber supply are as follows:

Objective 1:	Maintain current harvest levels as long as possible without creating disruptive shortfalls in future timber supplies.
Objective 2:	Create a long term timber supply capable of supporting a steady long-term provincial harvest level similar to current levels.
Objective 3:	Minimize the interim shortfall in provincial harvest anticipated before a steady long-term timber supply is achieved.
Objective 4:	Create a long term timber supply that will enable the timber quality profile of future harvests to be the same or better than the current profile

Until the strategic silviculture analysis is completed, the 1994 timber supply review can be used to infer some possible opportunities to increase timber supply in Robson Valley timber supply area.

2.4.1 Existing stand yield estimates

Sensitivity analysis showed that the short-term timber supply is very sensitive to changes in volumes of existing stands. When the existing stand yield estimates were increased by 10 %, the current harvest level could be maintained for 3 decades before the decline of 10 % per decade to the long term harvest level. For existing mature stands it is likely a question of conserving current stand yields from volume loss, rather than increasing yields.

The 1994 timber supply review estimated the average annual unsalvaged volume loss to catastrophic events to be 70, 428 cubic metres over the timber harvesting land base. The 1997 timber supply review data package estimates the annual loss to be 92,604 cubic metres. The dominant causes of volume loss are bark beetles, hemlock looper and fire. Disease and wind also contribute to the loss.

The following strategic opportunities should be considered to conserve current stand yields:
salvage harvest the dead and damaged timber, and then promptly reforest
use single tree treatments to limit the timber volume lost to bark beetles

2.4.2 Regenerated stand yield estimates

Sensitivity analysis showed that increasing the volume from regenerated stands by 10 % had no effect on short-term harvest levels but increased the long term harvest level to about 9 % higher than the base level.
The following strategic opportunities should be considered to increase regenerated stand yields:
Increase the rate of stand volume production through fertilization
Reduce the losses due to pests in regenerated stands
Improve estimates of site productivity

2.4.3 Minimum harvestable age.

Sensitivity analysis indicated that the timber supply is sensitive to the minimum harvestable age of stands. The minimum harvestable age was defined by the objective of harvesting a minimum volume per hectare and maximizing the timber produced over time. Minimum harvestable ages ranged from 80 to 140 years. When all minimum harvestable ages were decreased by 20 years, the current harvest level could be maintained for 2 decades before declining 10 % per decade in order to avoid future supply deficits. However, it also resulted in a 4% reduction in the long term harvest level.

For the increase to be realized the stands must grow unimpeded and stocking and density must be optimal. If not, silvicultural treatments will be needed just to maintain the base case estimate.

To reduce minimum harvestable age and thus increase timber supply, the following strategic opportunities should be considered:
Brush impeded stands to promote optimal growth
Conduct basic silviculture on all silviculture obligations
Establish new stands promptly where forests have been damaged or destroyed by fire or pests and have not been salvage logged
Plant and tend not satisfactorily restocked areas
Pre-commercial thin overstocked lodgepole pine stands

2.4.4 Green-up age

Sensitivity analysis showed that the timber supply is sensitive to green-up age. When the time to reach green-up is reduced, more volume is available in both the short and long term. The initial harvest level of the base case can be held for 2 decades before declining, and the long-term level is about 3 % higher than the base forecast.

The strategic opportunities listed for reducing minimum harvestable age could also act to reduce the green-up age by promoting optimal timber growth.

2.4.5 Visual quality objectives

Sensitivity indicated that the timber supply is sensitive to visual quality requirements in scenic areas. A report produced by Industrial Forestry Service Ltd. in 1998 suggested that a 9 to 11 % increase in long-term timber supply could be gained by applying partial cutting in scenic areas. Gains may be possible but consideration of partial cutting is outside the scope of this plan.

2.4.6 Size of the timber harvesting land base

Sensitivity analysis indicated that an increase of 10 % in the timber harvesting land base resulted in a new long-term harvest level about 11 % higher than the base harvest forecast.

Strategic opportunities to increase the timber harvesting land base include reforesting non-commercial cover types and non-commercial brush sites to commercial species and full production, and rehabilitating roads and landings to full timber production. However, these potential opportunities may be largely impractical in Robson Valley District due to steep terrain, and high costs.

2.4.7 Potential Treatments and Treatable Area Information

In the absence of a forest level strategic silviculture analysis, the *Guidelines for the Development of Resource Management Plans for 2000/01* give the following general priorities for treatments:

Priority	Activity
Highest	Meet legal silviculture prescription obligations on backlog areas
High	Brushing impeded areas
	Protecting forests from insect epidemics and disease
	Activities that contribute to maintaining current harvest levels and to minimizing the anticipated interim shortfall in timber supply.
	Activities that positively contribute to the Identified Wildlife Management Strategy
Medium	Reforestation of good and medium site backlog areas
	Stand tending to increase the merchantable volume of value of long term timber supply
	Stand tending and pruning to enhance the seral stage distribution and structure of the forest
Lower	Forest health enhancement activities where these offer greater returns on investment than other incremental silviculture activities
	Activities that enhance general habitat supply versus habitat supply for specific targeted species.

In Robson Valley timber supply area, the large, accessible backlog areas have been surveyed and treated where feasible to establish new stands of trees. The remaining backlog not satisfactorily restocked areas are located in inaccessible areas or as small areas within larger stocked blocks. The focus is now on maintaining and improving the silviculture investment. The area to be treated over the next five years is shown in Section 4 - Standard RMP Summary Tables.

2.4.8 Potential Strategies by Response Time Frame

2.4.8.1 Short Term and Medium Term:

Conduct a level 2 strategic silviculture analysis in 1999/2000 to more clearly identify the strategic silviculture opportunities for increasing timber supply in the short, medium and long term. This analysis does not guarantee a response in the short term, but will be done in the short term.

Conserve existing stand yields by promptly salvaging dead and damaged timber.

As shown in Section 4.4 Forest Health Maintenance Activities (Table D), conduct forest health maintenance activities, primarily surveys and single tree treatments, to control bark beetle outbreaks or hold populations until the infested timber can be harvested.

2.4.8.2 Long Term:

Conduct activities that will likely decrease minimum harvestable age and green-up age. As shown in Section 4.1 Backlog Activities (Table A), conduct surveys and brushing on impeded stands to promote optimal growth and maintain the silviculture investment. Reforest the remaining accessible backlog areas that are not satisfactorily restocked.

As shown in Section 4.5 Current Fire and Pest Activities (Table E) promptly reforest areas where the timber has been destroyed by fire or pests but has not been salvage harvested.

As indicated in Section 4.3 Forest Health Enhancement Activities (Table C), conduct forest health enhancement to reduce the stand volume losses due to pests such as white pine blister rust and armillaria root disease in regenerated stands.

In the level 2 strategic silviculture analysis investigate the potential to use fertilization to increase the rate of stand volume production, and the potential to use pre-commercial thinning of overstocked lodgepole pine stands to decrease the minimum harvestable age.

Investigate the potential to increase the timber harvesting land base by reforesting non-commercial cover types and non-commercial brush sites to commercial species and full production, and rehabilitating roads and landings to full production. Local knowledge suggests that opportunities may be severely limited by terrain and cost.

2.5 Working Targets

Maintain the current harvest level for another 10 years before dropping in 10% increments per decade to the long term harvest level.
Increase the long term harvest level by 5 to 10 %.

2.6 Job Outcomes

The following table provides estimates of potential job outcomes for activities proposed for 2000/01.

Activity proposed for 2000/01	Goals	Unit	Jobs days/unit	Jobs days	Direct Cost $/unit
Level 2 Strategic Analysis	1	report	-		
Backlog surveys	6500	ha	0.05	325	22
Backlog site preparation	50	ha	1	50	1000
Backlog brushing	400	ha	2	800	1000
Seed purchase	35,000	trees	-	-	
FH enhancement spacing	100	ha	1	100	250
FH enhancement pruning	150	ha	0.6	90	200
FH enhancement armillaria	307	ha	0.4	122	65
FH maintenance ground surveys	1500	ha	0.06	90	20
FH maintenance aerial surveys	32	hours	-	4	800
FH maintenance fall and burn	300	trees	0.3	90	100
FH maintenance MSMA treatment	200	trees	0.16	32	50
Pheromone baiting	500	trees	0.06	30	20
Other (budworm)	2000	ha	-	-	5
Current fire and pest surveys	1000	ha	0.04	40	25
Current fire and pest site preparation	40	ha	1	40	1000
Current fire and pest planting	100	ha	1.5	150	810
Current fire and pest brushing	50	ha	2	100	800

2.7 References

Ministry of Forests, Province of British Columbia, 1994. *Robson Valley TSA Timber Supply Analysis, September 1994.*
Ministry of Forests, Province of British Columbia, 1998. *Robson Valley Timber Supply Area Information Report, December 1998.*
Industrial Forestry Service Ltd. 1998. *An evaluation of available merchantable volume in areas subject to visual quality objectives.* Prepared in conjunction with British Columbia Ministry of Forests – Forest Practices Branch.

2.8 DRV Standard RMP Summary Tables

2.8.1 Backlog Activities (Table A)

TSA: Robson Valley

District: Robson Valley

	Five-year Plan Goals					Annual Plan 2000/01		
Legal Obligations	2000/ 2001	2001/ 2002	2002/ 2003	2003/ 2004	2004/ 2005	Funding ($000)	Unit Cost ($)	Priority
1 Planning/surveys/prescriptions	0	0	0	0	0	$0	#DIV/0!	0
2 Site preparation	0	0	0	0	0	$0	#DIV/0!	0
3 Planting	0	0	0	0	0	$0	#DIV/0!	0
4 Brushing	0	0	0	0	0	$0	#DIV/0!	0
5 Seed purchase (000's)	0	0	0	0	0	$0	#DIV/0!	0
Total Ha's	0	0	0	0	0	$0	#DIV/0!	
Backlog Reforestation								
1 Planning/surveys/prescriptions	800	100	100	100	100	$20,000	$25	3
2 Site preparation	50	50	50	50	50	$50,000	$1,000	4
3 Site restoration road/land. rehab	0	0	0	0	0	$0	#DIV/0!	9
4 Planting	0	50	50	50	50	$0	#DIV/0!	3
5 Brushing	0	0	0	0	0	$0	#DIV/0!	9
6 Seed purchase (000's)	35	35	35	35	35	$10,000	$0.2857	3
Total Ha's	850	200	200	200	200	$80,000		
Impeded areas								
1 Planning/surveys/prescriptions	5,700	5,000	4,000	3,000	3,000	$125,400	$22	1
2 Site preparation	0	0	0	0	0	$0	#DIV/0!	9
3 Planting	0	0	0	0	0	$0	#DIV/0!	9
4 Brushing	400	400	400	400	400	$400,000	$1,000	2
5 Seed purchase (000's)	0	0	0	0	0	$0	#DIV/0!	9
Total Ha's	6,100	5,400	4,400	3,400	3,400	$525,400		
Backlog Activities - Management Unit Total								
1 Planning/surveys/prescriptions	6,500	5,100	4,100	3,100	3,100	$145,400	$22	
2 Site preparation	50	50	50	50	50	$50,000	$1,000	
3 Site restoration road/land. rehab	0	0	0	0	0	$0	#DIV/0!	
4 Planting	0	50	50	50	50	$0	#DIV/0!	
5 Brushing	400	400	400	400	400	$400,000	$1,000	
6 Seed purchase (000's)	35	35	35	35	35	$10,000	$0.2857	
7 Studies (number)		0	0	0	0		#DIV/0!	0
Total Ha's	6,950	5,600	4,600	3,600	3,600	$605,400		

Notes:

Priority rating: Rate High=1&2, Medium=3, Low=4&5

Seed Purchase includes purchase of A class seed and cone collection, and nursery production and shipping costs.

Include opportunities for fill planting, rehabilitation of poorly performing stands and any site rehabilitation, planting and brushing activities on roads and landings that are proposed to be restored under site restoration under the Sustainable Harvest Program.

Include specific studies that need to be done to support this program area. Clearly identify in the RMP the type of study and realistic funding needs for 2000/2001. Indicate the level of funding required for subsequent years to continue these projects (where necessary) and add new projects.

2.8.2 Stand Tending Activities (Table B)

	Plan Goals (hectares)					2000/01		
	2000/2001	2001/02	2002/03	2003/04	2004/05	Funding ($000)	Average Unit Cost $	Priority[1]
Planning/Surveys/prescriptions								
Spacing								
Pruning								
Fertilizing								
Studies[2]								

Notes:

Priority rating: Rate High=1&2, Medium=3, Low=4&5. Priorities relate to meeting management objectives, timber supply/timber quality targets, and strategies for the management unit.

Include specific studies that need to be done to support this program area. Clearly identify in the RMP the type of study and realistic funding needs for 2000/2001. Indicate the level of funding required for subsequent years to continue these projects where necessary and add new projects.

2.8.3 Forest Health Enhancement Activities (Table C)

	Plan Goals (hectares)					2000/01		
	2000/2001	2001/02	2002/03	2003/04	2004/05	Funding ($000)	Average Unit Cost $	Priority[1]
Site rehab								
Spacing	100	100	100	100	100	25,000	250	2
Pruning	150	50				30,000	200	2
Studies[2]								
Others[3] armillaria	307	200	200	200	200	20,000	65	1

Activities included in Table C are aimed at enhancing the values of second growth stands.

To be eligible for FRBC funding, forest health enhancement activities must be consistent with two key strategic objectives:

increasing productivity and value of second growth forests; and
strengthening information for planning.

Key questions to ask with regards to forest health enhancement activities include:
will it *enhance* growth and yield?
will it *improve* our forest management practices through the gathering and sharing of better research and inventory information?
will it *promote* further understanding that will provide a sound basis for changes in practices?

Notes:
Priority rating: Rate High=1&2, Medium=3, Low=4&5

Include specific studies that need to be done to support this program area. Clearly identify in the RMP the type of study and realistic funding needs for 2000/2001. Indicate the level of funding required for subsequent years to continue these projects (where necessary) and add new projects.

Districts to define "other." Only treatments that enhance the health, volume or value of **second growth** forests are to be included.

2.8.4 Forest Health Maintenance Activities (Table D)

	Plan Goals					2000/01		
	2000/2001	2001/02	2002/03	2003/04	2004/05	Funding ($000)	Average Unit Cost $	Priority[1]
Ground Surveys (ha)	1500	1500	1500	1500	1500	30,000	20/ha	1
Aerial Surveys (hours of flying time)	32	30	30	30	30	25,000	800/hr	1
Fall and burn treatment (trees)	300	300	300	300	300	30,000	100/tree	1
MSMA treatment (trees)	200	200	200	200	200	10,000	50/tree	1
Pheromone baiting (trees)	500	500	500	500	500	10,000	20/tree	1
Defoliator spraying (ha)								
Studies[2]								
Other[3] Budworm	2000	1000	1000	1000	1000	10,000	5/ha	1

Activities included in Table D are primarily aimed at protecting mature timber from insects and disease (primarily the control of bark beetles and defoliators).

Even though FRBC may not fund these activities, the RMP is collecting information to identify and present funding opportunities and needs to the MoF executive.

Notes:
Priority rating: Rate High=1&2, Medium=3, Low=4&5

Include specific studies that need to be done to support this program area. Clearly identify in the RMP the type of study and realistic funding needs for 2000/2001. Indicate the level of funding required for subsequent years to continue these projects (where necessary) and add new projects.

Districts to define "other" treatments that are included.

2.8.5 Current Fire and Pest Activities (Table E)

TSA: Robson Valley

District: Robson Valley

Activities	Five-year Plan Goals					Annual Plan 2000/01		
	2000/ 2001	2001/ 2002	2002/ 2003	2003/ 2004	2004/ 2005	Funding ($000)	Unit Cost ($)	Priority
Planning/surveys/prescriptions	1,000	400	400	400	400	$25,000	$25	1
Site preparation	40	10	10	10	10	$40,000	$1,000	2
Planting	100	80	40	40	10	$81,000	$810	2
Brushing	50	50	50	50	50	$40,000	$800	2
Max. density spacing	0	0	0	0	0	$0	#DIV/0!	9
Studies (number)	0	0	0	0	0	$0	#DIV/0!	9
Total Ha's	1,190	540	500	500	470	$186,000	$156	

Activities included in Table E are primarily aimed at reforesting areas impacted by current fire and pest denudation.

Even though FRBC may not fund these activities, the RMP provides funding needs and opportunities to the MoF executive.

Notes:
Priority rating: Rate High=1&2, Medium=3, Low=4&5

Include specific studies that need to be done to support this program area. Clearly identify in the RMP the type of study and realistic funding needs for 2000/2001. Indicate the level of funding required for subsequent years.

2.8.6 Habitat Supply Activities (Table F)

(Footnote Domestic Range)

	Plan Goals (hectares)					2000/01		
	2000/ 2001	2001/02	2002/03	2003/04	2004/05	Funding ($000)	Average Unit Cost $	Priority[1]
Planning/surveys/prescriptions								
Site preparation								
Planting								
Brushing								
Spacing								
Pruning								
Studies[2]								
Others[3]								

FRBC may fund habitat enhancement and domestic range management activities such as: planting of Riparian Management Zones (and Riparian Reserve Zones under the Watershed Restoration Program) with hardwoods; spacing to produce mule deer winter habitat; spacing to control tree densities on range land; or pruning to maintain forage conditions.

Even though FRBC may not fund all these activities, the RMP process is collecting complete information to identify and present funding opportunities and needs.

Notes:

Priority rating: Rate High=1&2, Medium=3, Low=4&5

Include specific studies that need to be done to support this program area. Clearly identify in the RMP the type of study and realistic funding needs for 2000/2001. Indicate the level of funding required for subsequent years.

Districts to define "other" treatments that are included. Footnote domestic range activities.

3 Vanderhoof Forest District

3.1 Introduction

The following text and tables for the Vanderhoof Forest District (DVA), are consistent with the constraints/guidelines and objectives of the *Resource Planning Framework Guidelines for the Development of Resource Management Plans (RMP) for 2000/01.* Proposed five year investments in Silviculture related activities necessary to sustain harvest are presented and discussed.

3.2 Discussion

The sustainable Harvest component of this RMP contains resource priorities for backlog reforestation, stand tending, forest health enhancement, forest health maintenance and current fire and pest funding opportunities. Priorities were reached by consensus with our major stakeholders. Priority ranking utilised in the following tables is as follows. Rate High = 1&2, Rate Medium = 3, Rate Low = 4&5. Categories without planed activities were given priority rankings of nine (9) to ensure low priority rating. The level of activity was developed by utilising database (ISIS) reports, which were considered to be the best information available and recognising constraints to annual accomplishments (industry's ability to implement and traditional funding levels). Activities are detailed in the following text and tables.

3.3 Backlog

Table "A" details the DVA backlog activities. Our strategic objective *remains to ensure prompt and effective reforestation and stand tending on backlog sites until free growing stands are achieved.* The required activities to meet this objective are summarised by the following categories; legal obligations, backlog reforestation, and impeded areas. In this section, backlog brushing and planning/survey/prescriptions were given the highest priority ranking. This prioritisation is consistent with the "maintenance of investment strategy" DVA has been applying over the past several years. Backlog reforestation was given a moderate priority ranking, given the importance and potentially substantial amount of area available in the backlog brushing and planning/survey/prescriptions categories. *To reforest all backlog NSR sites by the year 2002*, and *to bring all backlog areas to free growing status by 2010* remain DVA goals. Funding of on going studies/monitoring/maintenance, such as height diameter ratios, site preparation and research trials are proposed for continued support.

3.4 Stand Tending

Table "B" details DVA's planned stand tending activities. These activities are consistent with our strategic objective *to manage incremental Silviculture activities for their maximum resource benefits, including AAC and fibre flow, for both their short and long term implications.* Based on the results from the initial findings from our *Strategic Silviculture Plan* (not complete) for DVA, spacing was given the highest priority of the stand tending activities (moderate overall). Planning/surveys/prescriptions was also given a moderate rating. Pruning and fertilisation were given low priory ratings at this time, despite the recognised benefits of these treatments to wood quality, and local employment opportunities.

3.5 Forest Health Enhancement

Table "C" details DVA's forest health enhancement activities. All the listed activities, except for site rehabilitation and studies, were given the lowest priority ranking in our district. This was done because of the limited success of such treatments in protecting/enhancing infected stands. Site rehabilitation was given a high priority ranking where it was necessary to re-establish a healthy productive crop on sites suffering pest damage severe enough to restrict them from meeting current free growing requirements. The forest health overview study/assessments of rusts will be continued and possibly expanded in 2001-01.

3.6 Forest Health Maintenance

Table "D" details DVA's forest health maintenance activities. Mountain pine beetle is the most significant pest threat to DVA. All the listed activities were given the highest priority in our district, and it is expected that this will continue for the foreseeable future. Helicopter logging is covered under the "other " category. A milling "on-site" study is also proposed, to evaluate it's feasibility/benefits as a forest health maintenance tool.

3.7 Current Fire and Pest

Table "E", detailing current fire and pest activities is not applicable to DVA. No significant areas denuded by fire or pests have been identified in DVA at this time.

3.8 Habitat Supply

Table "F" details DVA's proposed habitat supply activities. Presently there is only one proposed activity, a study of habitat use. The proposed study would evaluate if habitat use by large mammals (deer, moose and bear) of treated stands is stem density related. Large mammals are "high profile" wildlife species and it is important to monitor their responses to the trend of intensely managed stands.

3.9 DVA Standard RMP Summary Tables

3.9.1 Backlog Activities (Table A)

	Plan Goals (hectares)					2000/01		
	2000/2001	2001/02	2002/03	2003/04	2004/05	Funding ($000)	Average Unit Cost $	Priority[1]
Legal Obligations								
Planning/surveys/ prescriptions	0	25	101	180	30	0	20	9
Site preparation	39	0	0	0	0	25,285	650	1
Planting	71	0	0	0	0	28,520	400	1
Brushing	150	0	0	0	0	75,100	500	1
Seed Purchase[2]	71	0	0	0	0	15,330	215	1
Backlog Reforestation[3]								
Planning/surveys/ prescriptions	3,853	592	98	47	81	77,062	20	2
Site preparation	124	0	0	0	0	21,046	170	3
Site Restoration Road/land. rehab	0	0	0	0	0	0	0	9
Planting	377	25	25	25	25	150,880	400	3
Brushing	0	0	0	0	0	0	500	9
Seed Purchase[2]	377	25	25	25	25	81,055	3	
Impeded areas								
Planning/surveys/ prescriptions	15,342	15,342	10,289	2,101	719	306,840	20	2
Site preparation	0	0	0	0	0	0	0	9
Planting	0	0	0	0	0	0	0	9
Brushing	2,718	2,942	136	67	50	1,087,200	400	2
Seed Purchase[2]	0	0	0	0	0	0	0	9
Backlog Activities - Management Unit Total								
Planning/surveys/ prescriptions	19,195	15,959	10,488	2,328	830	383,902	20	
Site preparation	163	0	0	0	0	46,331	285	
Planting	449	25	25	25	25	179,400	400	
Brushing	2,868	2,942	136	67	50	1,162,300	405	
Seed Purchase[1]	448	25	25	25	25	96,385	215	
Studies[4]	4	4	4	4	4	70,000	17,500	3

Notes:

1. Priority rating: Rate High=1&2, Medium=3, Low=4&5
2. Seed Purchase includes purchase of A class seed and cone collection.
3. Include opportunities for fill planting, rehabilitation of poorly performing stands and any site rehabilitation, planting and brushing activities on roads and landings that are proposed to be restored under site restoration under the Sustainable Harvest Program.
4. Include specific studies that need to be done to support this program area. Clearly identify in the RMP the type of study and realistic funding needs for 2000/2001. Indicate the level of funding required for subsequent years to continue these projects (where necessary) and add new projects.

3.9.2 Stand Tending Activities (Table B)

	Plan Goals (hectares)					2000/01		
	2000/2001	2001/02	2002/03	2003/04	2004/05	Funding ($000)	Average Unit Cost $	Priority[1]
Planning/Surveys /prescriptions	1,500	1,500	3,076	3,077	3,076	30,000	20	3
Spacing	1,080	1,080	2,295	2,295	2,295	540,000	500	3
Pruning	50	50	50	50	50	60,000	1,200	4
Fertilizing	0	0	1,306	1,307	1,306	0	365	9
Studies[2]	0	0	0	0	0	0	0	9

Notes:

1. Priority rating: Rate High=1&2, Medium=3, Low=4&5. Priorities relate to meeting management objectives, timber supply/timber quality targets, and strategies for the management unit.
2. Include specific studies that need to be done to support this program area. Clearly identify in the RMP the type of study and realistic funding needs for 2000/2001. Indicate the level of funding required for subsequent years to continue these projects where necessary and add new projects.

3.9.3 Forest Health Enhancement Activities (Table C)

	Plan Goals (hectares)					2000/01		
	2000/2001	2001/02	2002/03	2003/04	2004/05	Funding ($000)	Average Unit Cost $	Priority[1]
Site rehab	10	10	10	10	10	10,000	1,000	2
Spacing	50	50	50	50	50	25,000	500	4
Pruning	50	50	50	50	50	60,000	1,200	5
Studies[2]	1	1	1	0	0	50,000	50,000	3
Others[3]	0	0	0	0	0	0	0	9

Activities included in Table C are aimed at enhancing the values of second growth stands.

To be eligible for FRBC funding, forest health enhancement activities must be consistent with two key strategic objectives:

1) increasing productivity and value of second growth forests; and
2) strengthening information for planning.

Key questions to ask with regards to forest health enhancement activities include:

- will it *enhance* growth and yield?
- will it *improve* our forest management practices through the gathering and sharing of better research and inventory information?
- will it *promote* further understanding that will provide a sound basis for changes in practices?

Notes:

1. Priority rating: Rate High=1&2, Medium=3, Low=4&5
2. Include specific studies that need to be done to support this program area. Clearly identify in the RMP the type of study and realistic funding needs for 2000/2001. Indicate the level of funding required for subsequent years to continue these projects (where necessary) and add new projects.
3. Districts to define "other." Only treatments that enhance the health, volume or value of **second growth** forests are to be included.

3.9.4 Forest Health Maintenance Activities (Table D)

	Plan Goals					2000/01		
	2000/2001	2001/02	2002/03	2003/04	2004/05	Funding ($000)	Average Unit Cost $	Priority[1]
Ground Surveys (ha)	1,200	1,300	1,400	1,200	1,000	140,400	117	1
Aerial Surveys (hours of flying time)	90	100	110	90	70	55,800	620	1
Fall and burn treatment (trees)	5,000	5,500	6,000	5,000	4,000	375,000	75	1
MSMA treatment (trees)	0	0	0	0	0	0	0	9
Pheromone baiting (trees)	1,000	1,100	1,200	1,000	800	10,000	10	1
Defoliator spraying (ha)	0	0	0	0	0	0	0	9
Studies[2]	1	0	0	0	0	20,000	20,000	1
Other[3]	3,000	4,000	5,000	3,000	2,000	165,000	55	1

Activities included in Table D are primarily aimed at protecting mature timber from insects and disease (primarily the control of bark beetles and defoliators).

Even though FRBC may not fund these activities, the RMP is collecting information to identify and present funding opportunities and needs to the MoF executive.

Notes:

1. Priority rating: Rate High=1&2, Medium=3, Low=4&5
2. Include specific studies that need to be done to support this program area. Clearly identify in the RMP the type of study and realistic funding needs for 2000/2001. Indicate the level of funding required for subsequent years to continue these projects (where necessary) and add new projects.
3. Districts to define "other" treatments that are included.

3.9.5 Current Fire and Pest Activities (Table E)

	Plan Goals (hectares)					2000/01		
	2000/ 2001	2001/02	2002/03	2003/04	2004/05	Funding ($000)	Average Unit Cost $	Priority[1]
Planning/surveys/ prescriptions	0	0	0	0	0	0	0	9
Site preparation	0	0	0	0	0	0	0	9
Planting	0	0	0	0	0	0	0	9
Brushing	0	0	0	0	0	0	0	9
Max density spacing	0	0	0	0	0	0	0	9
Studies[2]	0	0	0	0	0	0	0	9

Activities included in Table E are primarily aimed at reforesting areas impacted by current fire and pest denudation.

Even though FRBC may not fund these activities, the RMP provides funding needs and opportunities to the MoF executive.

Notes:

1. Priority rating: Rate High=1&2, Medium=3, Low=4&5
2. Include specific studies that need to be done to support this program area. Clearly identify in the RMP the type of study and realistic funding needs for 2000/2001. Indicate the level of funding required for subsequent years.

3.9.6 Habitat Supply Activities (Table F)

(Footnote Domestic Range)

	Plan Goals (hectares)					2000/01		
	2000/2001	2001/02	2002/03	2003/04	2004/05	Funding ($000)	Average Unit Cost $	Priority[1]
Planning/surveys/ prescriptions	0	0	0	0	0	0	0	9
Site preparation	0	0	0	0	0	0	0	9
Planting	0	0	0	0	0	0	0	9
Brushing	0	0	0	0	0	0	0	9
Spacing	0	0	0	0	0	0	0	9
Pruning	0	0	0	0	0	0	0	9
Studies[2]	1	1	1	1	1	16000	16000	4
Others[3]	0	0	0	0	0	0	0	9

1. FRBC may fund habitat enhancement and domestic range management activities such as: planting of Riparian Management Zones (and Riparian Reserve Zones under the Watershed Restoration Program) with hardwoods; spacing to produce mule deer winter habitat; spacing to control tree densities on range land; or pruning to maintain forage conditions.
2. Even though FRBC may not fund all these activities, the RMP process is collecting complete information to identify and present funding opportunities and needs.

Notes:

1. Priority rating: Rate High=1&2, Medium=3, Low=4&5
2. Include specific studies that need to be done to support this program area. Clearly identify in the RMP the type of study and realistic funding needs for 2000/2001. Indicate the level of funding required for subsequent years.
3. Districts to define "other" treatments that are included. Footnote domestic range activities.

4 Fort St James Forest District

4.1 Basic Data

4.1.1 Land Area:

There are 3,714,000 hectares in the Fort St. James Forest District, which is 40% of the entire Prince George Timber Supply Area (PG TSA). The timber harvesting land base is 1,260,000 hectares.

Source: Fort St. James Land Resource Management Plan (LRMP) and PG TSA Socio-Economic Analysis 1995

4.1.2 Allowable Annual Cut (AAC):

The current Allowable Annual Cut (AAC) for the entire Prince George TSA is 9.364 million cubic metres. Fort St. James supplies about one third of that cut.
Source: LRMP and Prince George Timber Supply Review 1 (PG TSR1)

4.1.3 Current Harvest Forecast:

The current harvest forecast is 3.2 million cubic metres. It will likely increase to approximately 4 million cubic metres in future years as cut is transferred to the Fort St. James District from the Prince George District.

Source: David Soles, Acting District Manager

4.1.4 Site Class Profile:

Evidence based on regional studies conducted by the BCFS and the application of local professional judgement was submitted indicating that site indexes are underestimated in small diameter, fire-origin pine stands. If the site productivity of these stands is underestimated, future timber growth of these stands and hence the sustainable long-term harvest level may be higher than projected in the BCFS analysis. Also, minimum harvest ages and the time required to reach green-up in these areas may be overestimated. Although increased site indexes could mean a potential increase in the long-term timber supply, the BCFS analysis showed that increasing yield estimates from regenerated stands by 10 percent would have no effect on the short-term harvest projection because all of the timber harvested in the short term is from existing stands. However, it is worth noting that the lack of a short term effect may have been due to the harvest flow pattern imposed in the BCFS analysis. It is possible that the short term harvest level might have been capable of increasing under different flow patterns.
Based upon studies to date and my experience with northern forests, it is my understanding that the site index of some stands is underestimated. However, the magnitudes and corresponding impacts on volumes, green-up ages and minimum harvest ages are uncertain. Therefore, while it is likely that the long-term projected harvest level is higher than indicated in the BCFS analysis, it seems reasonable to me to wait for further evidence before concluding whether or not it is safe to assume any short term effects exist.
A provincial paired-plot survey, which is examining site productivity, is expected to be completed by the spring of 1997 and will provide statistically sound information required to facilitate assessment of site indexes in particular areas, including the Prince George

TSA. As this matter is intended for review, any findings can be appropriately considered in a future determination.
Source: PG TSA 1999/08/23

4.1.5 Age Class Profile:

The Prince George TSA, has a well balanced age distribution with no significant age class gaps. Pine stands dominate the TSA, covering about one-half of the timber harvesting land base. Spruce and balsam stands cover the remainder of the TSA along with a very small component of Douglas-fir stands primarily in the Prince George and Fort St. James Districts.
Stands up to 40 years old have resulted mainly from reforestation efforts with spruce and pine. A large proportion of the TSA is covered with stands aged 40 to 140 years, which support harvesting in the medium-term. Pine stands dominate in the 41 to 160 year age range, generally having become established after large wildfires. Northern areas burned by wildfire often regenerate naturally as pine stands resulting in large areas being covered by even-aged pine stands. Approximately one-half of the timber harvesting land base consists of pine stands 121 years or older; or spruce, balsam and fir stands aged 141 years or older. As a consequence of seral succession, stands older than 160 years tend to be dominated by spruce and balsam.
Source: PG TSA 1999/08/23

Approximately 70% of the Fort St. James Forest District, or 2.7 million hectares is comprised of mature and over-mature timber, highly susceptible to pest damage. The District has and will continue to have an active forest health program due to continued presence of and timber losses from forest stand pests. The presence of four different bark beetles, pine, spruce, Douglas-fir, and balsam, as well as spruce budworm result in extensive damage and value losses within the District. A conservative estimate of infested area for bark beetle alone is 55 000 hectares. This value for 1999 infestations will more than double due to mild winters and insufficient efforts for control. Based on 1997 figures, budworm infestation covered approximately 253 000 hectares, though historical evidence indicates a doubling in size every year so the figure for 1999 will be closer to 1 million hectares.

Source: Degagne, John Resource Management Plan Submission

4.1.6 Tree Species Profile:

Pine stands dominate the TSA, covering about one-half of the timber harvesting land base. Spruce and balsam stands cover the remainder of the TSA along with a very small component of Douglas-fir stands primarily in the Prince George and Fort St. James Districts.
Stands up to 40 years old have resulted mainly from reforestation efforts with spruce and pine.
Source: PG TSA 1999/08/23

4.2 Issues

Forest health concerns with bark beetles and spruce budworm is a critical issue.
Approximately 70% of the Fort St. James Forest District, or 2.7 million hectares is comprised of mature and over-mature timber, highly susceptible to pest damage. The District has and will continue to have an active forest health program due to continued presence of and timber losses from forest stand pests. The presence of four different bark beetles, pine, spruce, Douglas-fir, and balsam, as well as spruce budworm result in extensive damage and value losses within the District. A conservative estimate of infested area for bark beetle alone is 55 000 hectares. This value for 1999 infestations will more than double due to mild winters and insufficient efforts for control. Based on 1997 figures, budworm infestation covered approximately 253 000 hectares, though historical evidence indicates a doubling in size every year so the figure for 1999 will be closer to 1 million hectares.

The Fort St. James District has not been complacent in its pest management activities. Vigorous control activities have been carried out to the extent made possible by funds provided. Complete control has obviously not been possible. Further effort has been made to complete a District Bark Beetle Management Strategy to direct control activities and available resources into priority areas.

Effort is also being placed to manage spruce budworm. Research projects completed by Forestry Canada and sponsored by the Ministry of Forests are furthering our understanding of landscape dynamics of budworm infestations. The work being done will predict the probability of outbreak occurring in a stand, measure the long-term impacts of budworm defoliation on timber productivity, measure budworm densities, and provide a map showing extent of current infestation.

Recognizing increasing forest health problems as well as increased Provincial awareness of the impact of pests, the District Office has allocated more staffing resources to the Forest Health Department. Besides the STO4 position already in place, a LSO2 and an STO3 position has been allocated to combat the challenges. Planning and operational activities will be increased to reduce losses from pests. Continued funding at requested levels is required to maintain planned activities, reduce losses to pests, and increase Forest Health.

Source: John DeGagne District Acting Forest Health Planning Forester

Backlog concerns are a high priority issue. Not satisfactorily restocked (NSR) areas occur on 2839 hectares. Planned surveys will classify areas and generate prescriptions to identify treatments needed to reach free growing or reclassify non-treatable sites.
Treatments will co-ordinate seedling production, site preparation and planting and aim to eliminate NSR areas by 2004/2005.
The program, at this rate, will be about 30% higher than historic levels. The magnitude of increase should not be a problem because the total amount of area and funds required is relatively small. The challenge comes in knowing that funds will be available to complete the multi-year co-ordination of sowing seed, site preparation and follow up with planting. Licensees and MOF are reluctant to start the process if the continuity of funding can not ensure a site is planted.

Impeded stand concerns are a high priority issue. Brushing treatments and spacing of impeded stands to protect investments in plantations and meet free growing are scheduled. Assuming planned planting, brushing, spacing and forest health treatments are successful, this program should lead to free growing stands on all stands logged before October 1987 by the year 2020.

Timber quantity will only be affected by silviculture activities which stock or reclassify NSR land. The impact will be small because there are less than 3000 hectares of NSR in the district. The priority is high because it is a basic silviculture obligation.

Concerns were raised in the TSR rational about whether or not it is appropriate to represent growth for all backlog NSR areas according to the Table Interpolation Program for Stand Yields (TIPSY) managed stand yield curves. Rehabilitation of some backlog areas has been deferred to accommodate locally important wildlife habitat or to ensure green-up adjacency constraints are met. The delays in rehabilitation could affect the timing of restocking relative to assumptions employed in the analysis, as well as potentially affecting stand growth. It is therefore worthwhile to consider the modelled backlog performance in this analysis as a maximum level that is unlikely to be achieved given the circumstances. –Source: (TSR 1)

Timber Quality will receive a positive benefit from the spacing treatments planned. Piece size should be bigger contributing to log value and lower logging costs. Trees may become merchantable at a slightly younger age because of their greater piece size. Species selection may also improve timber quality.
Pre commercial thinning work is aimed for areas close to existing mills which may have a positive benefit on harvest costs. Priority is considered moderate to low.

Habitat supply will have a negative impact on the available timber harvesting land base (THLB) by setting aside areas which supported timber previously and using the sites for wildlife habitat and biodiversity. Habitat supply issues are identified in the Land Resource Management Plan (LRMP) and its implementation plan. Most projects in the plan will appear as inventory activities. Projects with an impact on sustainable harvest are recorded in the Habitat supply activities table. The projects maintain elk and caribou habitat by sustaining their habitat or are related studies. Priority is considered moderate to high.

4.3 Incremental Silviculture History

Incremental silviculture history is shown in the table below. It indicates that juvenile spacing has been completed on 1252.6 hectares between 1995 and 1998. Pruning occurred on 305.7 hectares between 1996 and 1998. Surveys and layout were done on 1415.5 hectares between 1996 and 1998. Activities completed in 1999 are not included in this data.

About 500 hectares of juvenile spacing were treated in 1999. The resource management plan (RMP) shows an intent to space 768 hectares in 2000. This is a realistic program level increase with respect to proponent expectations and our work force. The 550 hectares of surveys/prescriptions and layout supports this trend.

This information has not been included in the basis for the most recent AAC determination.

4.3.1 Incremental Silviculture History Table for 1995 to 1998

Opening	Treatment	Technique	Method	Treat. Date.	Area
93K03900 5	JS	MA	LAYOT	19-Jul-96	45.
93K06000 7	JS	MA	LAYOT	19-Jul-96	120.8
93K06700 1	JS	MA	LAYOT	19-Jul-96	61.2
93K06900 16	JS	MA	LAYOT	19-Jul-96	36.5
93K08000 3	JS	MA	LAYOT	19-Jul-96	39.7
93K08700 6	JS	MA	LAYOT	19-Jul-96	67.4
93K09000 7	JS	MA	LAYOT	19-Jul-96	57.1
				Total	427.7
93J03100 16	JS	MA	POWER	10-Nov-95	34.1
93J03100 17	JS	MA	POWER	16-Feb-99	45.1
93J03200 5	JS	MA	POWER	15-Sep-96	13.2
93J03200 6	JS	MA	POWER	10-Oct-96	57.2
93J03200 7	JS	MA	POWER	10-Sep-97	6.7
93J03200 8	JS	MA	POWER	10-Aug-98	26.2
93J03200 9	JS	MA	POWER	10-Apr-96	65.5
93J03200 10	JS	MA	POWER	10-Aug-98	10.3
93J03200 11	JS	MA	POWER	10-Aug-98	14.9
93J03200 12	JS	MA	POWER	10-Aug-98	41.9
93J03300 57	JS	MA	POWER	10-Sep-96	42.7
93J03300 58	JS	MA	POWER	10-Aug-96	17.3
93J03300 59	JS	MA	POWER	10-Aug-96	14.9
93J03300 60	JS	MA	POWER	10-Aug-96	20.1
93J03300 61	JS	MA	POWER	18-Aug-96	31.1
93J03300 62	JS	MA	POWER	10-Oct-96	68.8
93J04200 34	JS	MA	POWER	18-Sep-95	25.
93J04200 35	JS	MA	POWER	09-Sep-96	33.4
93J04200 36	JS	MA	POWER	15-Jun-96	5.6
93J04200 37	JS	MA	POWER	06-Nov-96	13.8
93J04200 38	JS	MA	POWER	11-Jul-96	88.2
93J04200 39	JS	MA	POWER	10-Sep-96	4.4
93J04200 40	JS	MA	POWER	15-Sep-96	6.1
93J04200 41	JS	MA	POWER	10-Sep-96	3.1

93J04300	8	JS	MA	POWER	06-Nov-98	21.5
93J04300	8	JS	MA	POWER	06-Nov-98	21.5
93J04300	14	JS	MA	POWER	02-Nov-98	39.1
93J05100	6	JS	MA	POWER	31-Jul-97	24.8
93J05100	6	JS	MA	POWER	04-Dec-95	45.
93K05600	11	JS	MA	POWER	15-Aug-97	24.8
93K05600	17	JS	MA	POWER	31-Aug-97	7.1
93K05600	31	JS	MA	POWER	18-Oct-96	52.3
93K05600	31	JS	MA	POWER	18-Oct-96	52.3
93K06000	7	JS	MA	POWER	23-Sep-96	120.8
93K07900	9	JS	MA	POWER	01-Nov-96	8.5
93K08000	3	JS	MA	POWER	14-Aug-96	39.7
93K08900	2	JS	MA	POWER	04-Oct-96	48.5
93K09000	7	JS	MA	POWER	14-Aug-96	57.1
					Total	1252.6
93J05100	6	PR	MA	HANDS	30-Apr-96	31.
93J05100	6	PR	MA	HANDS	30-Apr-96	21.9
93K05600	11	PR	MA	HANDS	08-Oct-98	17.9
93K06000	7	PR	MA	HANDS	25-Oct-96	120.8
93K07900	9	PR	MA	HANDS	12-Nov-96	8.5
93K08900	2	PR	MA	HANDS	30-Oct-96	48.5
93K09000	7	PR	MA	HANDS	17-Dec-97	57.1
					Total	305.7
93J03200	1	SU	FE	PLOT	15-Feb-97	46.4
93J03300	3	SU	FE	PLOT	15-Feb-96	88.8
93K05600	11	SU	FE	PLOT	15-Feb-97	48.5
93K05600	17	SU	FE	PLOT	15-Feb-97	17.9
93K05600	31	SU	FE	PLOT	15-Feb-97	52.3
93K05600	31	SU	FE	PLOT	15-Feb-97	52.3
93K06000	7	SU	FE	PLOT	15-Feb-97	217.3
93K06700	1	SU	FE	PLOT	15-Feb-97	61.2
93K06900	16	SU	FE	PLOT	15-Feb-97	36.5
93K07900	9	SU	FE	PLOT	15-Feb-97	8.5
93K08000	3	SU	FE	PLOT	15-Feb-97	39.7
93K08700	6	SU	FE	PLOT	15-Feb-97	67.4
93K08900	2	SU	FE	PLOT	15-Feb-97	67.4
93K09000	7	SU	FE	PLOT	15-Feb-97	57.1
93N05100	14	SU	JS	PLOT	04-Nov-98	96.1
93J03100	4	SU	TR	GPS	04-Jul-97	5.6
93J05100	6	SU	TR	GPS	15-Jul-97	24.8
					Total	987.8

4.4 Opportunities to Increase Timber Supply

Minimum opportunities to increase timber supply exist in rehabilitating NSR sites which are classed as non commercial cover and brush (NCCBR) Such activities are very expensive and must be weighed against the economic benefits. In many cases the areas are best suited to being left untreated to accommodate biodiversity and wildlife habitat. Often these areas tend to be our more valuable nutrient rich sites which represent a loss to the crop tree land base. Left to biodiversity they may still produce crop trees which are fewer in number but have high volume. Each site should be evaluated on its own attributes as expressed in a survey and prescription. The number of sites suited to rehabilitation is very small.
Any treatment to increase timber supply should occur on very productive ground.

4.4.1 Potential Treatments and Treatable Area Information

The Prince George Timber Supply Review 1 (TSR 1) states that while there is potential for treatments to increase timber supply, the amount of area to be treated is small and therefore would not have a significant impact on timber supply. Few plans exist for such activities.

The area requiring stocking in this district is under 3000 hectares and could be restocked in the next 5 years. Some of the area will be reclassified through ingrowth or for wildlife or biodiversity concerns.

This district has a forest health concern with gall rust which is preventing some areas previously called sufficiently restocked (SR) from becoming free growing. Without sanitation pruning, the areas will become NSR. This would have a negative effect on timber supply. Sanitation pruning is planned for 100 hectares in each of the next five years.

These projects are high priority and can be completed in the short term.

4.4.2 Potential Strategies by Response Time Frame

4.4.2.1 Short Term

Planting Improved seed and stock: Planting the largest, best quality available stock will give seedlings the best chance to overcome brush competition. Planting costs will be high to account for handling large trees.

Site preparation: Site preparation is included here because of its link to planting oversized stock. It may range from none [raw planting] to spot herbicide, aerial herbicide, mounding or winter shearing depending upon appropriate treatment needs, licensee philosophy and public pressure. The costs for these different treatments can vary greatly.

Sanitation pruning: This forest health activity is included here because of the impact on timber supply. Treatment will prevent area incorrectly classified as SR from becoming

NSR. Two years following treatment the area should be reclassified as free growing. The alternative is to rehabilitate and plant at higher cost.

4.4.2.2 Medium Term

None

4.4.2.3 Long Term

The BCFS analysis assumed basic silviculture obligations would be met but did not include any explicit assumptions regarding intensive silviculture. District staff anticipate that there will be a significant spacing program initiated in plantations aged 21 to 40 years. Many plantations in the area already benefit from improved seed and stock types which is expected to yield some additional volume. In addition, pruning and fertilization are being tested in some areas but as yet are not practised widely. If these activities are conducted more extensively, it is anticipated that there will be a small positive impact on timber volume available in the mid to long-term. It is expected that most of the return from these activities will be realized through increased timber quality and value. Public input indicated concern that the use of herbicides and chemical fertilizers will have adverse affects on the environment, biodiversity, wildlife, soil and natural ecosystems. The precautions necessitated by the Forest Practices Code and other existing legislation and regulations should ensure that due care is taken during any use of herbicides and fertilizers.

Source: TSR 1

Spacing impeded stands can be done either manually or with the aid of herbicides. Manual treatments are more labour intensive, more expensive and often need to be repeated in two or three years. Herbicide treatments can be by aerial application or the more labour intensive ground application; either of which is less expensive and more effective than the manual treatment.

The increasing trend is to treat impeded stands manually rather than with herbicides in this district. Licensees are expected to balance manual with chemical treatments on crown land in the same proportion as they do in their treatment of their appraisal ground.

A few small areas greater or equal to 10 hectares on good site have prescriptions in place to proceed with rehabilitation work. They will not have a significant impact on the timber supply. Over three hundred hectares of NSR sites are scheduled for planting in 2000. Some of those sites will be planted following mounding or brushing treatments. Those areas have the highest priority for planting so that the investment in site preparation will not be lost.

4.5 Opportunities to Improve Timber Quality

Opportunities to Improve Timber Quality and value exist through improved seed and stock, spacing and pre-commercial thinning. The pre-commercial thinning product objective is high quality sawlog with a quadratic mean diameter of 28 cm DBH and an average piece size of approximately 0.45m3/tree based on TASS runs. This objective includes a commercial thinning in 40 years (2039). The increased value of the stand will come from increased wood quality, lower logging costs due to fewer, larger pieces and close proximity to the mill.
Gains due to improved seed and stock will improve timber quality, but mostly quantity. This is discussed in section 3.4

4.5.1 Potential Treatments

Spacing: This activity will improve quality through increased piece size and species selection. The plan for this year schedules 768 hectares for treatment at $632/hectare. The cost will be about $485,376. The amount of work, generated through prescriptions, is slightly more than historic levels. The priority is medium.

Pre-commercial thinning of 50 year old fire origin pine: This activity is to improve timber quality and stand value through increased piece size and lower logging and hauling costs. The actual return from this activity has been questioned by several knowledgeable MOF sources. The prescriptions incorporate TASS runs. The plan for this year schedules 136 hectares for treatment. The cost will be about $150,000. The amount of work, generated through prescriptions, is less than half of historic levels. The priority is low.

Studies: There are two ongoing stand tending studies which are planned and implemented by the licensees. One collects growth and yield data. The other collects data from plots [with controls] in the pre-commercial thinning of 50 year old fire origin pine.

4.5.2 Potential Strategies by Response Time Frame

Standard silvicultural regimes and the AAC are based on sawlog quality second growth stands.

4.5.3 Timber Quality Forecast Scenarios

None available for this district.

4.6 Habitat Supply

4.6.1 Specific issues

The natural seral stages of succession can cause changes to the availability of natural habitats. The control of fire in our forests has slowed the 'renewal' process nature used to maintain a supply of habitat for certain species. By using prescribed fire, existing grassland habitats can be maintained. Other silviculture management techniques may be effective in maintaining habitat or making alternative habitats available. The resource management plan schedules planning, surveys, prescriptions, prescribed burning treatments and a study to manage at-risk species and habitats.

4.6.2 Opportunities to mitigate

Five habitat supply issues are given a priority in the LRMP through discussions between the MOF and MELP. No activities are planned for year 2000/2001. Impacts of silvicultural practices on lichen habitats will be studied in 20001/2002. In 2002/2003, the development of a management plan to maintain at-risk species and habitats is scheduled. In 2003/2004, sites for wildlife enhancement using prescribed fire as a tool will be located. Treatment of sites where fire is prescribed for grassland enhancement is planned for 2004/2005. These activities will mitigate habitat supply problems or enhance habitat quality.

4.6.3 Geographic areas

Opportunities to mitigate habitat supply problems or enhance habitat quality exist throughout the district.

4.6.4 Opportunities within existing strategies and guidelines

The Fort St James LRMP gives direction, strategies and identifies activities. More detailed information about these activities can be found in the Implementation Plan for the Fort St. James LRMP.

4.7 Forest Health Goals and Objectives

4.7.1 Forest Health Maintenance

The following tables identify activities that require continued funding as well as other activities that require time and effort on the part of both licensee and Ministry staff. Activities pursued follow goals and objectives listed in the cabinet approved Fort St. James Land and Resource Management Plan. Three objectives and associated strategies follow:

1. Minimise losses to forest resources from damaging agents through aggressive and prompt pest management, where and when appropriate.

Strategy	Comment
• Inventory managed stands for pests and diseases and develop practices to minimise or prevent further loss of timber value.	• Pre-free growing stands are licensee's responsibility. $ No effort currently made towards inventorying pest problems associated with free growing stands. This activity will be incorporated into the District's Forest Health Strategy within the 5-year planning period. Further survey work required on free growing stands (not part of the forest health proposal for this year).
• Identify, survey and map defoliator species.	$ This is being done on a semi-yearly basis but should be completed yearly as work from research indicates appropriate management techniques.
• Consider research projects for defoliator species.	$ Projects began in 1998. More detailed predictive modelling is being completed in 1999. Yearly plot re-measurement required.

2. Actively manage forest health to maintain or enhance forest productivity and sustainability.

Strategy	Comment
• Complete forest health assessments for forest development planning to address management of infested timber while evaluating the extent of the susceptible forest type.	• The main focus of assessments is on areas considered for cutting permit development. $ Ministry responsible areas are completed according to priority as funds are available and impacts to other resources identified. In the past, many infested areas not assessed or treated, thereby impacting valuable resources. The District's Forest Health Strategy will improve this effort, however resources still required for operational/treatment activities.
• Actively manage for the prompt establishment and long-term maintenance of healthy plantations.	• As discussed in objective 1.
• Monitor, evaluate and pro-actively manage forest health to ensure forest values are maintained.	$ Yearly sketch flights are completed for broad based monitoring. Further evaluations and management are made on a site-specific/priority basis. Not all areas are evaluated as mention above. Resources are required for operational/treatment activities. • LRMP identifies forest values.

3. Manage beetle populations while maintaining natural forest attributes.

Strategy	Comment
• Develop and implement long-term strategies for maintaining beetle populations at endemic levels.	• This is being completed through the District Bark Beetle Strategic Plan. It is recognized that endemic levels for mature and old stands are quite high.
• Consider the social and economic aspects in addition to scientific processes, when developing forest health management plans.	• This includes consideration of the LRMP objectives, the district bark beetle strategy and good forest management.
• Provide opportunities for community and stakeholder involvement in decision-making on beetle management issues that will affect the viewscape of communities and the backcountry within the planning area.	• This being completed through the referral process of Forest Development Plans. • Other site-specific public presentations and development of the LRMP involves public input into management.

4.8 Working Targets

The working target for timber supply will remain at current levels.
The current harvest forecast is 3.2 million cubic metres. It will likely increase to approximately 4 million cubic metres in future years.

Source: David Soles, Acting District Manager

The working target for timber quality is to maintain the current quality profile throughout the planning horizon. This will be accomplished through treatments to free growing stands.

4.9 Incremental Silviculture Program

The incremental silviculture program is described by activity and year in the following Tables: A, B, C, and F. All activities fall within a reasonable range of historic funding levels.

4.10 Job Outcomes

Job outcomes are dependent on licensee activities. The district should maintain ample opportunities for local contractors through the competitive bid process. In addition, licensees have either First Nation partners or hire contractors who employ aboriginal people.

Much of the planned work is seasonal, but pre-commercial thinning can be done even after there is snow on the ground. This extends the traditional work window right through to spring if there is not an unusual excess of snow giving some stability to that group of workers.

4.11 References

References are listed throughout the text as specific sources are quoted or noted.

4.12 DJA Standard RMP Summary Tables

4.12.1 Backlog Activities (Table A)

	Plan Goals (hectares)					2000/01		
	2000/2001	2001/02	2002/03	2003/04	2004/05	Funding ($000)	Average Unit Cost $	Priority[1]
Legal Obligations								
Planning/surveys/prescriptions								
Site preparation								
Planting	75	-	-	-	-	60	800	1
Brushing								
Seed Purchase[2]								
Backlog Reforestation[3]								
Planning/surveys/prescriptions	2,540	1,500	800	400	200	127	50	1
Site preparation	357	393	364	241	150	321	900	2
Site Restoration Road/land. Rehab	-	-	-	-	-	-	-	
Planting	250	389	390	360	241	200	800	2
Brushing	83	70	150	75	75	48	583	3
Seed Purchase[2]	100,000	100,000	100,000	100,000	-	37	.37/tree	2
Impeded areas								
Planning/surveys/prescriptions	20,850	16,650	15,200	8,240	4,320	1,043	50	1
Site preparation	-	-	-	-	-	-	-	-
Planting	-	-	-	-	-	-	-	-
Brushing	2069	2139	2531	1711	752	1,206	583	1
Seed Purchase[2]	-	-	-	-	-	-	-	-
Backlog Activities – Management Unit Total								
Planning/surveys/prescriptions	23,390	18,150	16,000	8,640	4,520	1,170	50	1
Site preparation	357	393	364	241	150	321	900	2
Planting	325	389	390	360	241	260	800	2
Brushing	2152	2209	2681	1786	827	1254	583	1
Seed Purchase[1]	100,000	100,000	100,000	100,000	-	37	.37/tree	
Studies[4]	3	1	1	1	1	24	8000	3

Notes:

1. Priority rating: Rate High=1&2, Medium=3, Low=4&5

2. Seed Purchase includes purchase of A class seed and cone collection.

3. Include opportunities for fill planting, rehabilitation of poorly performing stands and any site rehabilitation, planting and brushing activities on roads and landings that are proposed to be restored under site restoration under the Sustainable Harvest Program.

4. Include specific studies that need to be done to support this program area. Clearly identify in the RMP the type of study and realistic funding needs for 2000/2001. Indicate the level of funding required for subsequent years to continue these projects (where necessary) and add new projects.

4.12.2 Stand Tending Activities (Table B)

	Plan Goals (hectares)					2000/01		
	2000/2001	2001/02	2002/03	2003/04	2004/05	Funding ($000)	Average Unit Cost $	Priority[1]
Planning/Surveys/prescriptions	550	550	550	550	550	28	50	2
Spacing	768	751	832	996	744	485	635	3
Pruning	60	50	50	50	50	76	1265	5
Fertilizing	65	50	50	50	50	34	519	5
Pre commercial thinning	136	100	75	75	75	150	1100	4
Studies[2]	4	4	4	4	4	65	16,250	3

Notes:

Priority rating: Rate High=1&2, Medium=3, Low=4&5. Priorities relate to meeting management objectives, timber supply/timber quality targets, and strategies for the management unit.

Include specific studies that need to be done to support this program area. Clearly identify in the RMP the type of study and realistic funding needs for 2000/2001. Indicate the level of funding required for subsequent years to continue these projects where necessary and add new projects.

4.12.3 Forest Health Enhancement Activities (Table C)

	Plan Goals (hectares)					2000/01		
	2000/ 2001	2001/02	2002/03	2003/04	2004/05	Funding ($000)	Average Unit Cost $	Priority[1]
Site rehab	-	-	-	-	-	-	-	-
Spacing	-	-	-	-	-	-	-	-
Pruning	100	100	100	100	100	127	1265	2
Studies[2] managed stand pests	-	Whole district $30,000	whole district $20,000	-	-	-	-	2
Others[3]	-	-	-	-	-	-	-	-

Activities included in Table C are aimed at enhancing the values of second growth stands.

To be eligible for FRBC funding, forest health enhancement activities must be consistent with two key strategic objectives:

increasing productivity and value of second growth forests; and
strengthening information for planning.

Notes:
Priority rating: Rate High=1&2, Medium=3, Low=4&5

Include specific studies that need to be done to support this program area. Clearly identify in the RMP the type of study and realistic funding needs for 2000/2001. Indicate the level of funding required for subsequent years to continue these projects (where necessary) and add new projects.

Districts to define "other." Only treatments that enhance the health, volume or value of **second growth** forests are to be included.

4.12.4 Forest Health Maintenance Activities (Table D)

	Plan Goals					2000/01		
	2000/2001	2001/02	2002/03	2003/04	2004/05	Funding ($000)	Average Unit Cost $	Priority[1]
Ground Surveys (ha)	15 000	10 000	10 000	10 000	10 000	2250	150	2
Aerial Surveys (hours of flying time)	130	130	130	130	130	87.23	671	1
Fall and burn treatment (trees)	500	500	500	500	500	50	100	3
MSMA treatment (trees)	8 000	8 000	8 000	8 000	8 000	400	50	2
Pheromone baiting (trees)	2 000	2 000	2 000	2 000	2 000	40	20	2
Defoliator spraying (ha)	0	0	0	0	0	0		
Studies[2]	1	1	1	1	1	35	35,000	1
Other[3]								

Notes:
Priority rating: Rate High=1&2, Medium=3, Low=4&5

Spruce budworm permanent sample plots established in 1999. Plots require re-measurement every year for five years. Plots established to support predictive spruce budworm hazard model.

No other projects planned at this time.

Activities included in Table D are primarily aimed at protecting mature timber from insects and disease (primarily the control of bark beetles and defoliators).

Even though FRBC may not fund these activities, the RMP is collecting information to identify and present funding opportunities and needs to the MoF executive.

Notes:
Priority rating: Rate High=1&2, Medium=3, Low=4&5

Include specific studies that need to be done to support this program area. Clearly identify in the RMP the type of study and realistic funding needs for 2000/2001. Indicate the level of funding required for subsequent years to continue these projects (where necessary) and add new projects.

Districts to define "other" treatments that are included.

4.12.5 Forest Health Goals and Objectives

The following tables identify activities that require continued funding as well as other activities that require time and effort on the part of both licensee and Ministry staff. Activities pursued follow goals and objectives listed in the cabinet approved Fort St. James Land and Resource Management Plan. Three objectives and associated strategies follow:

1. Minimize losses to forest resources from damaging agents through aggressive and prompt pest management, where and when appropriate.

Strategy	Comment
• Inventory managed stands for pests and diseases and develop practices to minimize or prevent further loss of [illegible]er value.	• Pre-free growing stands are licensee's responsibility. $ No effort currently made towards inventorying pest problems associated with free growing stands. This activity will be incorporated into the District's Forest Health Strategy within the 5-year planning period. Further survey work required on free growing stands (not part of the forest health proposal for this year).
• Identify, survey and map defoliator species.	$ This is being done on a semi-yearly basis but should be completed yearly as work from research indicates appropriate management techniques.
• Consider research projects for defoliator species.	$ Projects began in 1998. More detailed predictive modelling is being completed in 1999. Yearly plot re-measurement required.

2. Actively manage forest health to maintain or enhance forest productivity and sustainability.

Strategy	Comment
• Complete forest health assessments for forest development planning to address management of infested timber while evaluating the extent of the susceptible forest type.	• The main focus of assessments is on areas considered for cutting permit development. $ Ministry responsible areas are completed according to priority as funds are available and impacts to other resources identified. In the past, many infested areas not assessed or treated, thereby impacting valuable resources. The District's Forest Health Strategy will improve this effort, however resources still required for operational/treatment activities.
• Actively manage for the prompt establishment and long-term maintenance of healthy plantations.	• As discussed in objective 1.

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Strategy	Comment
• Develop and implement long-term strategies for maintaining beetle populations at endemic levels.	• This is being completed through the District Bark Beetle Strategic Plan. It is recognized that endemic levels for mature and old stands are quite high.
• Consider the social and economic aspects in addition to scientific processes, when developing forest health management plans.	• This includes consideration of the LRMP objectives, the district bark beetle strategy and good forest management.
• Provide opportunities for community and stakeholder involvement in decision-making on beetle management issues that will affect the viewscape of communities and the backcountry within the planning area.	• This being completed through the referral process of Forest Development Plans. • Other site-specific public presentations and development of the LRMP involves public input into management.

Resource Allocation

Table D indicates the planned allocation of resources.

4.12.6 Current Fire and Pest Activities (Table E)

No needs identified.

	Plan Goals (hectares)					2000/01		
	2000/ 2001	2001/02	2002/03	2003/04	2004/05	Funding ($000)	Average Unit Cost $	Priority[1]
Planning/surveys/prescriptions								
Site preparation								
Planting								
Brushing								
Max density spacing								

Studies[2]								

Activities included in Table E are primarily aimed at reforesting areas impacted by current fire and pest denudation.

Even though FRBC may not fund these activities, the RMP provides funding needs and opportunities to the MoF executive.

Notes:
Priority rating: Rate High=1&2, Medium=3, Low=4&5

Include specific studies that need to be done to support this program area. Clearly identify in the RMP the type of study and realistic funding needs for 2000/2001. Indicate the level of funding required for subsequent years.

4.12.7 Habitat Supply Activities (Table F)

(Footnote Domestic Range)

	Plan Goals (dollars)					2000/01		
	2000/ 2001	2001/02	2002/03	2003/04	2004/05	Funding ($000)	Average Unit Cost $	Priority[1]
Planning/surveys/prescriptions	-	-	$20,000	$55,000	$25,000	-	-	2
Site preparation	-	-	-	-	$25,000	-	-	2
Planting	-	-	-	-	-	-	-	-
Brushing	-	-	-	-	-	-	-	-
Spacing	-	-	-	-	-	-	-	-
Pruning	-	-	-	-	-	-	-	-
Studies[2]	-	$30,000	-	$10,000	$10,000	-	-	2
Others[3]	-	-	-	-	-	-	-	-

FRBC may fund habitat enhancement and domestic range management activities such as: planting of Riparian Management Zones (and Riparian Reserve Zones under the Watershed Restoration Program) with hardwoods; spacing to produce mule deer winter habitat; spacing to control tree densities on range land; or pruning to maintain forage conditions.

Even though FRBC may not fund all these activities, the RMP process is collecting complete information to identify and present funding opportunities and needs.

Notes:

Priority rating: Rate High=1&2, Medium=3, Low=4&5

Include specific studies that need to be done to support this program area. Clearly identify in the RMP the type of study and realistic funding needs for 2000/2001. Indicate the level of funding required for subsequent years.

Districts to define "other" treatments that are included. Footnote domestic range activities.

4.13 RECOMMENDED FUNDING LEVELS FOR 2000/01

Program Funding Priorities Fort St. James District RMP

Strategic Objective	Program	Minimum Funding Level	Optimal Funding Level	Priority 1, 2, 3, etc.	Comments
Sustainable Harvest	Backlog Silviculture	2,929,000	3,066,000	1	Basic silviculture obligations/TSR priority/protecting investment.
	Stand Tending	578,000	838,000	1	Incremental timber supply benefits to wood quality and rotation age
	Forest Health Enhancement	126,500	126,500	1	Stands will reach free growing with treatment, but will likely become NSR without treatment
	Forest Health Maintenance	2,862,230	2,862,230	Critical	Forest health program has an impact on health, vigour and vitality of forest and wi affect the long term resource decisions and management options
	Current Fire And Pest	----------	----------	----------	No activities
	Habitat Supply	----------	----------	Activities planned for future years. LRMP	LRMP
Strengthen Sustainable Forest Management	Inventories	1,622,300	2,156,300	2	Transfer of cut/LRMP/Code requirements
Enhance Environmental Values	Watershed Planning	**Add in**	**Add in**	2	Identify and alleviate or restore environmental risks
	Road & Bridge Maintenance	75,000	207,000	2	Public safety concerns
	Recreation Site and Trail Maintenance	66,000	81,000	2	Public safety concerns
	Total	8,259,030***	9,337,030***		***Add in Watershed***

F

5 Mackenzie Forest District

5.1 Introduction

The Mackenzie Resource Management Plan is intended to satisfy the information needs of Forest Renewal BC business planning process. The Sustainable Harvest component of this plan emphasises six specific program areas: stand tending, backlog reforestation, site restoration, forest health enhancement, forest health maintenance and current fire and pest. The program areas are not discrete investments; rather, they must link and interact within the greater context of forest management as a whole.

Forest management has six key elements:

- *Forest management objectives are clearly expressed in measurable terms.(objectives)*

  Desired products, services, amenities and uses must be defined for a specific forest area, and which, collectively, define forest management objectives. The supply of these objectives must be specified in time, space, quantity and quality in order to define the forest structure that must be achieved by management. Forest level objectives and public forest policies must be attainable, given initial forest structural limitations and reasonable management expectations, otherwise forest management will fail.

- *The forest management problem is analysed, and a strategic solution is designed.(strategy)*

  The dynamics of the forest must be analysed to determine if resource supply limitations prevent the attainment of forest management objectives. This analysis specifies the forest management problem, and may identify management opportunities to resolve it. Depending on the opportunities available, one or more forest management strategy is designed and evaluated. Forest management strategic analysis requires an integrated forest information system which describes stand conditions and locations, specifies forest resource values, provides a reliable method of projecting stand dynamics, and a means of forecasting the dynamics of the entire forest estate (Baskerville and Moore 1988).

- *Stand level tactics are designed (tactics)*

  Within the context of the management strategy, a tactical analysis must be conducted to select the most appropriate stand level silvicultural interventions based on biological effectiveness, economic efficiency, and social acceptability.

- *The forest management program is developed to implement tactics and strategy (program)*

  An implementation schedule is prepared which identifies what interventions will occur at which locations in the forest, and at what time. The schedule is then implemented operationally, based on the availability of forest management funds.

- *The program management program is implemented in the forest*

  Forest management must actually be implemented in the forest

- *The stand and forest response is evaluated and forest management performance is periodically reviewed and revised.*

  Actual stand level responses, and cumulative forest level effects must be compared with projections and forecasts. Also, forest level values, objectives and government policies change over time. Forest management direction should be revised periodically to remain in step with any changes that affect management strategy.

The absence of any one of these key elements seriously limits the chance of forest management success. Figure 3.1 is a conceptual depiction of the six key elements of forest management. The arrangement of the elements is both hierarchical and circular. Management decisions in each element are made within the context of the preceding element, and subsequently provide the context for decisions to be made in succeeding elements, hence it represents a hierarchical decision structure.

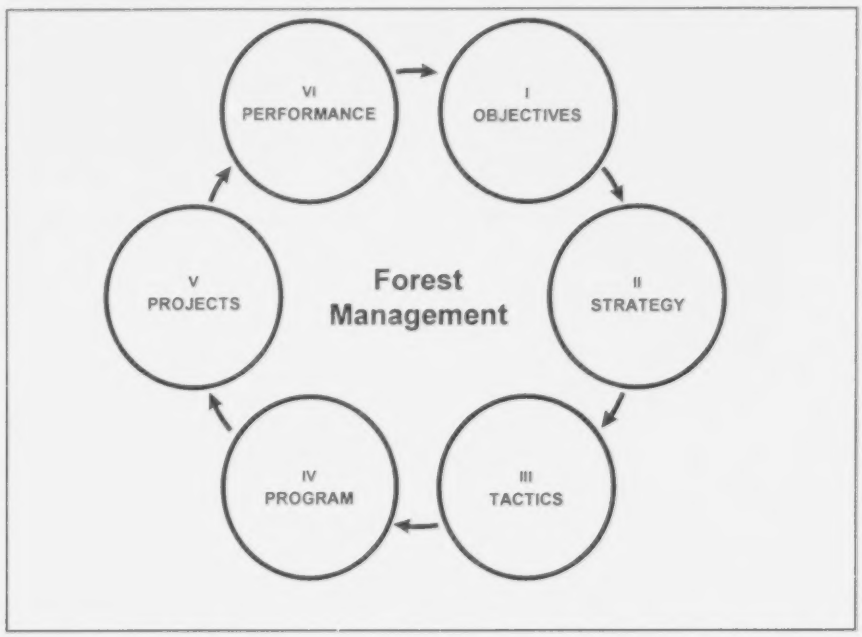


Figure 3.1 A conceptual diagram representing the hierarchical and circular inter-relationships of the six key elements of forest management.

The following resource needs analysis and recommendations are organised in a forest management framework. The Mackenzie TSA timber resource supply is focus of this component of the RMP. This approach is well suited to timber resource management decisions, which are of a hierarchical, interactive, and often dependent nature. Investments in any management action must be guided by higher order decisions, and tend to influence subsequent decisions at lower levels.

5.2 Basic Data

5.2.1 Land Area

The Mackenzie TSA is one of the largest TSA's in the province, and covers a total of about 6.13 million hectares of land and water around Williston Lake in the north-central area of British Columbia. Of this total, approximately 6 097 386 is Crown Land.

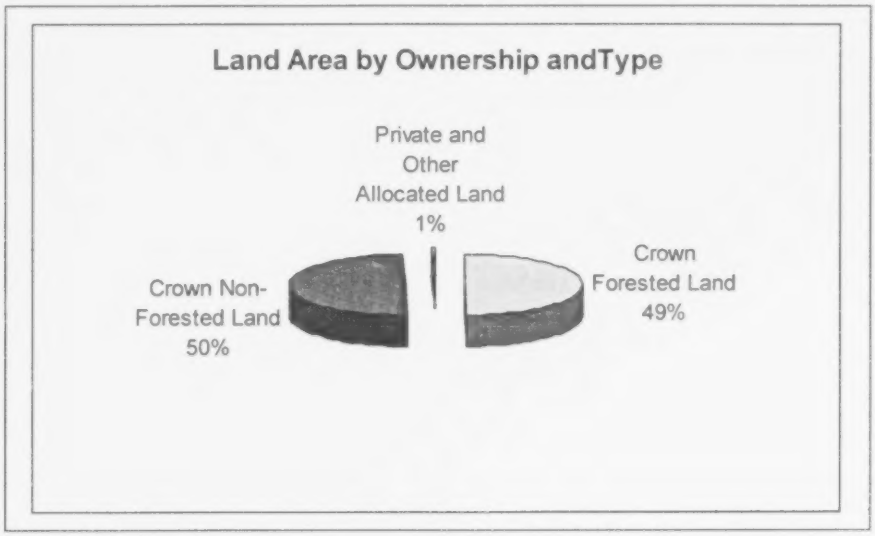


Figure 3.2 Classification of land area within the Mackenzie TSA.

About 1.16 million hectares of the area are considered available for timber harvesting and production under current management practices (TSR 1, 1995). These forests are comprised largely of mixed stands, including mixed conifer stands and conifer-broadleaf mixtures. Engelmann spruce, white spruce, subalpine fir and lodgepole pine are the principle conifer species, occurring in mixtures of variable proportion with trembling aspen, black cottonwood and paper birch.

Currently inoperable (inaccessible, steep, low volume and environmentally sensitive) stands account for one half of the productive forest land base, and non-coniferous stands account for 7.5%.

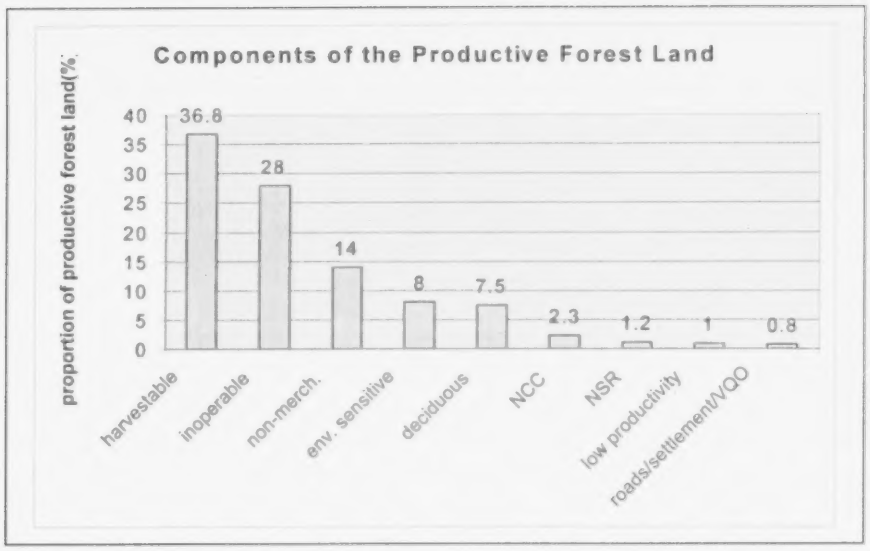


Figure 3.3 Classification of productive forest land in the Mackenzie TSA.

5.2.2 Annual Allowable Cut (AAC)

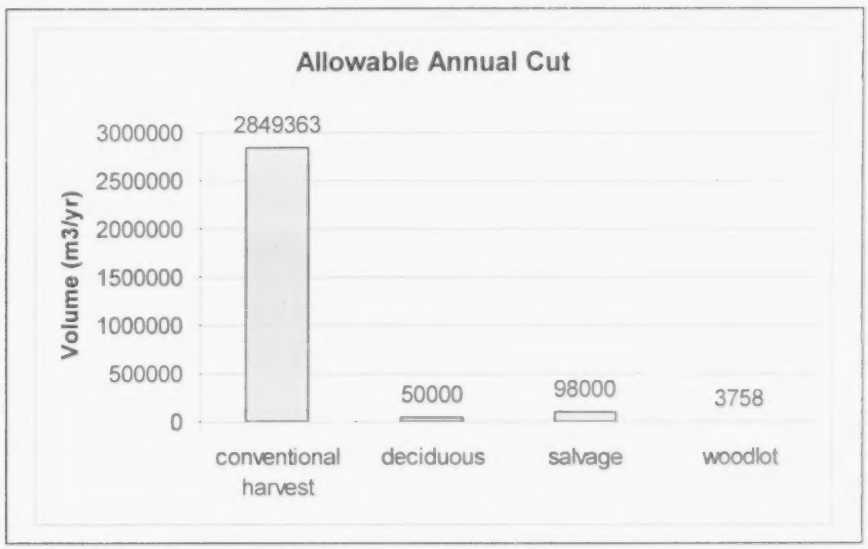


Figure 3.4 Apportionment of allowable annual cut in the Mackenzie TSA

Based on the 1995 Timber Supply Review, the current, short term harvest level is 2.951 million cubic metres/year. In 1995, it was estimated that the proportion of this harvest volume which would comprise the salvage of insect damaged, diseased and wind damaged timber would be 98 000 m^3/yr. An additional 50 000 m^3/yr of deciduous timber is available for harvest in the TSA, and approximately 4000 m3/yr is excluded from the total as Woodlot AAC.

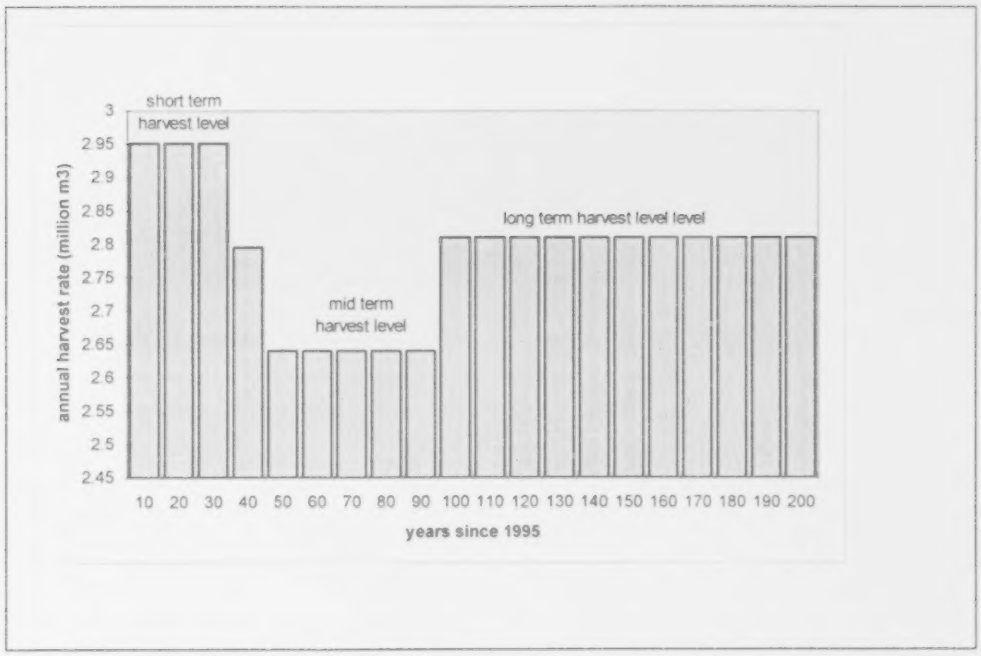


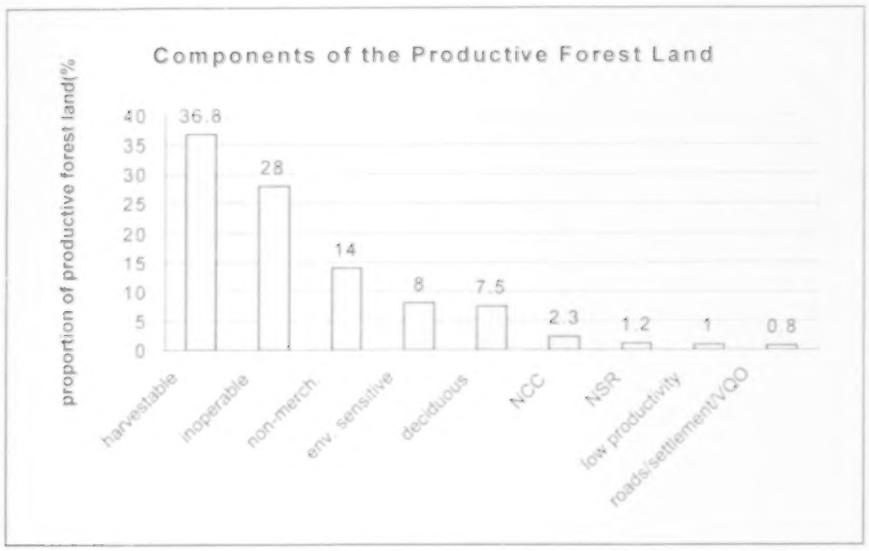
Figure 3.5 Base case timber supply projection for the Mackenzie TSA (basis for the 1995 allowable annual cut determination

5.2.3 Current Harvest Forecast

The annual allowable cut determined by the Chief Forester was based on the review of a number of timber supply projection scenarios. The results of these analyses suggest that an annual harvest of 2.951 m^3/ha/yr can be maintained for approximately 25 years. At that time (circa 2025), in order to avoid future severe supply shortages the harvest must decline to 2.640 million cubic metres, where it will remain for the medium term of approximately 95 years. Beyond 95 years from now an increase to a long term sustainable harvest of 2.81 million cubic metres is predicted.

5.2.4 Site Class Profile

The profile of site productivity potential and distribution of timber growing potential is illustrated in Figures 3.6. Almost half (45%) of the sites in the timber harvesting land base are classified as having medium productivity; 37% have poor or low productivity, and the smallest proportion, 18%, have good timber growing potential. The larger proportion of area younger than minimum harvest age in each site productivity class indicates that harvesting has concentrated more on medium and good site productivity (28-30%, respectively) compared with low site productivity (approximately 14%).



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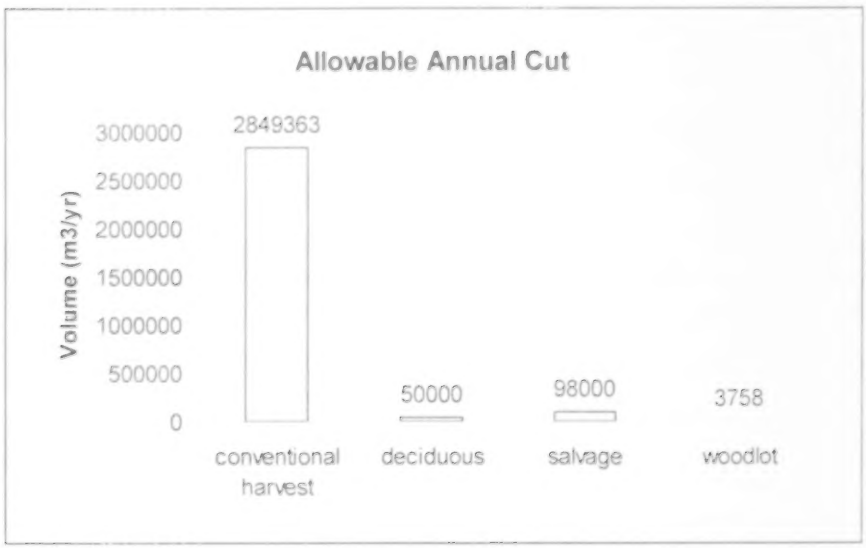

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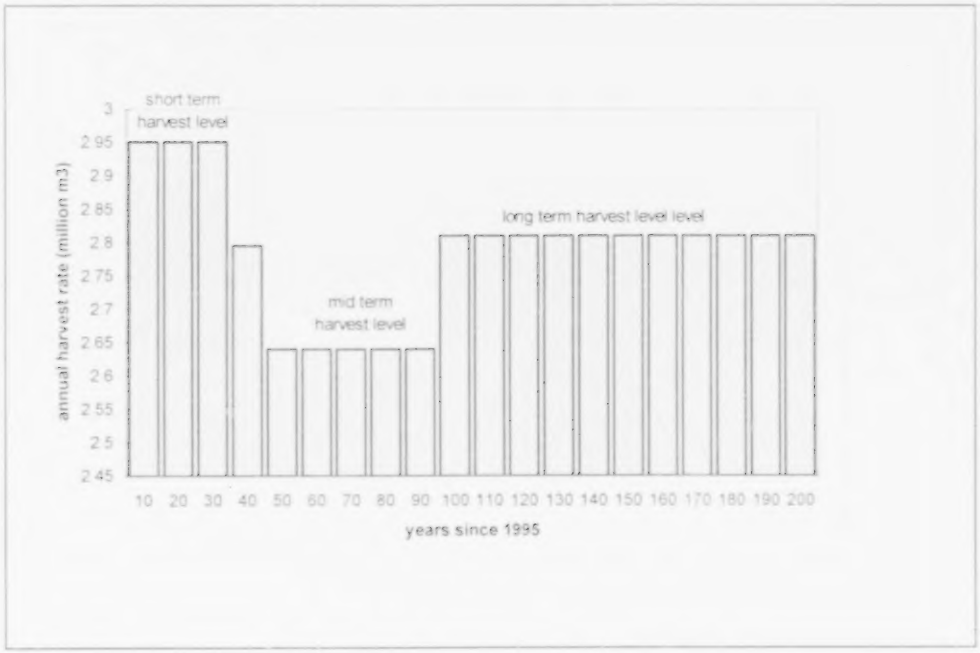

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5.2.4 Site Class Profile

The profile of site productivity potential and distribution of timber growing potential is illustrated in Figures 3.6. Almost half (45%) of the sites in the timber harvesting land base are classified as having medium productivity; 37% have poor or low productivity, and the smallest proportion, 18%, have good timber growing potential. The larger proportion of area younger than minimum harvest age in each site productivity class indicates that harvesting has concentrated more on medium and good site productivity (28-30%, respectively) compared with low site productivity (approximately 14%).

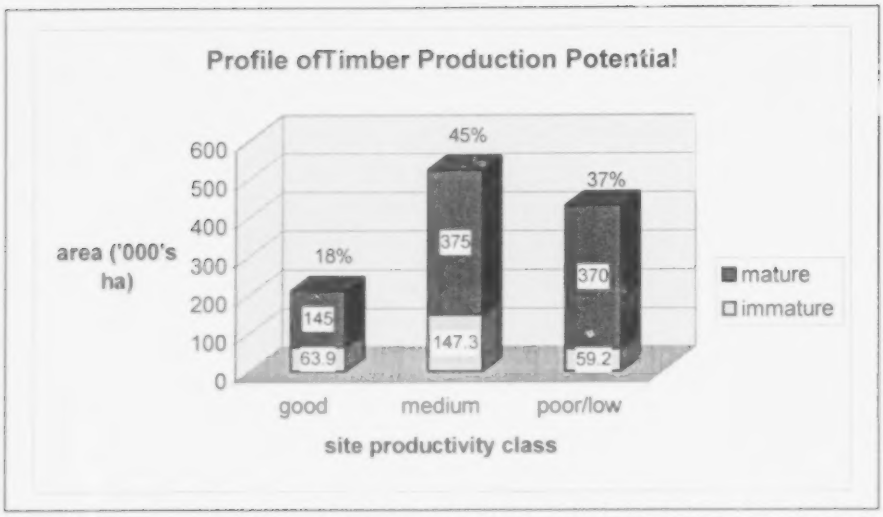
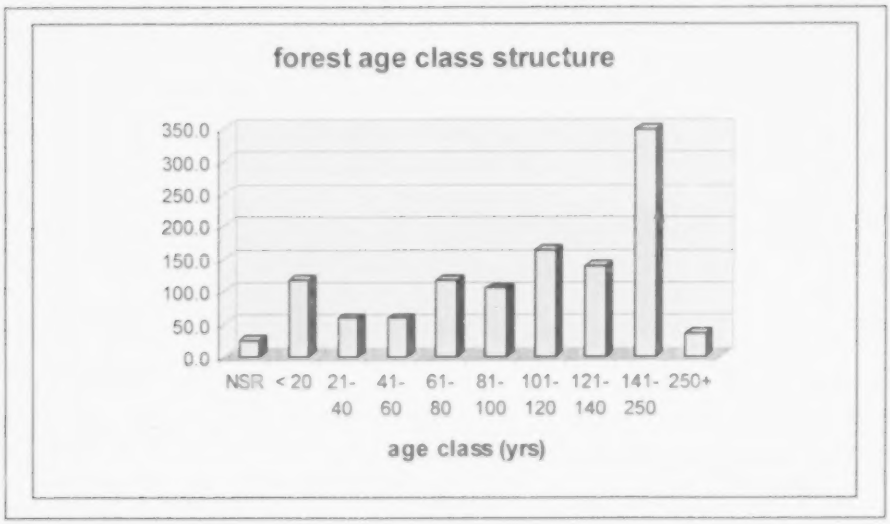


Figure 3.6 Profile of site and timber production potential in the Mackenzie TSA.

Figure 3.7 Forest age class structure of the Mackenzie TSA



5.2.5 Age Class Profile

Approximately 11% of all stands less than 20 years of age, 27% are 21-100 years, 35% are 101-200 years of age, and slightly more than 25% are greater than 200 years old. Almost 77% of stands in the timber supply land base are at or above minimum harvest age. The age class structure (Figure 3.7) indicates no large age class gaps that would suggest an opportunity for either short or longer term timber supply shortages.

5.2.6 Tree Species Profile

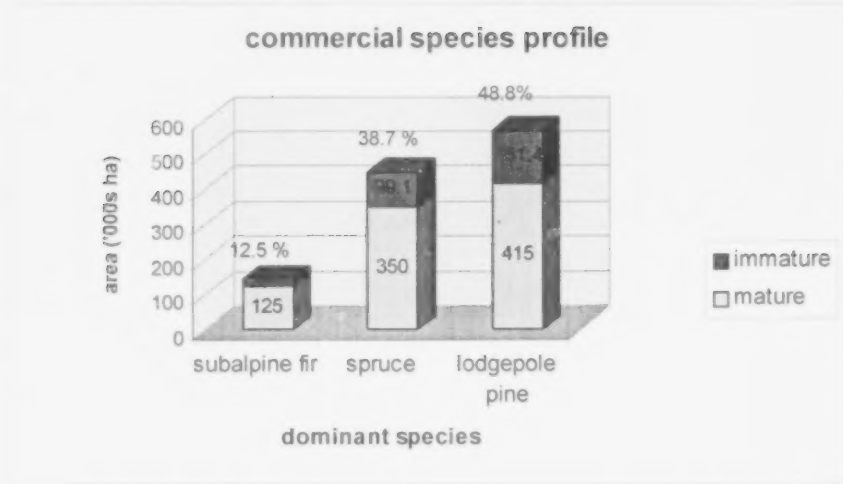


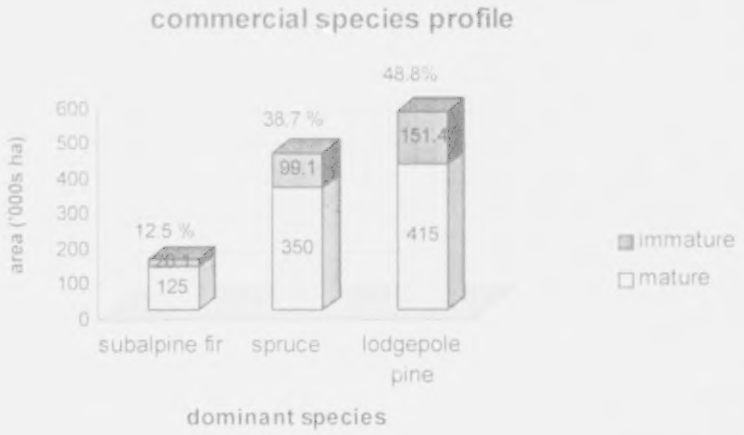
Figure 3.8 Profile of commercial tree species in the Mackenzie TSA

Almost 77% of stands in the timber harvest land base are at or above the minimum harvestable age. There is, however, some variation around this proportion for each species group. For example (see Figure 3.8) 88% of subalpine fir stands, 73% of lodgepole pine stands and 77% of spruce stands are currently older than minimum harvest age.

The proportion of stands that has reached minimum harvestable age for each species relative to the total land base could indicated the degree to which harvesting has spread evenly amongst species, or alternatively, has concentrated on a particular species. Figure 3.8 suggests that harvesting has been concentrated slightly more in lodgepole pine, although the trend is not pronounced. The slightly larger proportion of pine dominated sites is likely due to fire history in the TSA.

The high proportion of area older than harvestable age for each species indicates that there would be no short term difficulties in locating merchantable stand of any particular species. However, this forest structural characteristic also makes much of the existing timber stocks quite susceptible to damage and losses from bark beetles, as evidenced by the current epidemic level attacks in the northern and northwester portions of the unit.

5.2.6 Tree Species Profile



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5.3 Issues

5.3.1 Management Issues

Forest management does not exist without a clear statement of objectives. From a timber resource management perspective it is impossible to undertake specific silvicultural interventions without a clearly defined objectives and management purpose. This holds true whether for reforestation, pre-commercial thinning, brushing or any other silvicultural action. Confusion of purpose inevitably leads to confusion of action.

Forest level objectives incorporate public forest values, and reflect resource user demands for specific goods, services and forest conditions. The current structure and future dynamics of the whole forest determines the availability and sustainability of forest values, and the degree to which forest level objectives are achievable.

Forest level objectives and higher level plans are intended to help define the general purpose of forest management. They are, however, often insufficient to define clear and specific forest management objectives, which must be expressed in measurable, spatial and temporal terms. This additional detail is necessary since forest objectives are the basis for allocating of forest resources to forest user groups, and for specifying the assumptions used in all subsequent elements of forest management.

Currently in the Mackenzie TSA most statements of forest level objectives are too vague, and higher level plans are either incomplete, or inadequate. For example, specific timber objectives should be determined through a timber supply analysis as an objective schedule of desired harvests. This has not, however, been the focus of the 1995, or previous Timber Supply Reviews which focussed on supporting allowable annual cut (AAC) determinations.

Non-timber objectives may be contained within LRMP's and considered in TSR analysis reports, however objective units of measurement are usually not specified. This is largely true of the as yet uncompleted Mackenzie LRMP. Current employment statistics may be included in higher level plans, and may be described in TSR documents, yet employment needs projections and objectives are not.

As a result of these limitations, every effort should be made to complete the LRMP, and to establish explicit resource user requirements (resource type, quantity, quality, location and timing). Without this information, uncertainty will exist at all subsequent stages of forest management and silvicultural decision making. The required level of resource planning detail will no doubt evolve and improve over time. In the meantime, however, setting forest management objectives will depend heavily on the professional judgement of forest planners, and strategic silvicultural direction and investment must take into account the uncertainties inherent in this approach.

5.3.2 Strategic Issues

Silviculturists place great importance on practising "good" silviculture by carefully selecting and prescribing appropriate interventions based on stand specific considerations. Frequently, however, the connection between stand level silviculture and

forest management objectives is not made. The absence of this critical linkage means that stand level interventions are undertaken with little appreciation of their effects on forest resource supply requirements (i.e. timber quality, size, harvest flow, location and species).

Stand-by-stand silviculture assumes that a series of individual stand treatments results in an additive impact on resource supply at the forest level. However, the effects of stand level actions are usually not additive at the forest level, and stand-by-stand silviculture ignores the complex interaction of factors influencing resource supply, and reduces the likelihood of successfully controlling forest dynamics to achieve management objectives.

A forest management strategy should be the guiding reference for stand level silviculture. The relative "goodness" of a silvicultural intervention is difficult to judge unless viewed within a strategic context. Without this important contextual linkage, even basic silvicultural expenditures are difficult to evaluate objectively, except in terms of discharging legally binding reforestation obligations.

A comprehensive forest management strategy is therefore necessary before rational choices of stand level interventions can be made. For example, without a strategic context, local stand density management interventions may result in:

- costly silvicultural investments with little or no forest level benefits;
- cumulative forest-level effects which exacerbate a forest management problem; and
- large opportunity costs if actual forest management problems are ignored.

The following strategic issues have been considered in the 1999/2000 Resource Management Plan:

Strategic Planning

The most critical gap in timber resource management in the Mackenzie TSA is the absence of a strategic plan. This is due in part to the absence of complete and measurable resource management objectives, and is a limitation beyond the scope of this resource management plan. Ultimately, however, the necessary strategic analyses pre-requisite to a timber management strategic plan have yet to be undertaken for the management unit.

It is therefore essential that Mackenzie stakeholders initiate the necessary strategic planning procedures without delay. Selection of the most appropriate timber management tactics and operations is difficult in the absence of a clear strategy. Completion of a TSA timber management strategy which is harmonised with water, habitat, wildlife and social strategies should be a high investment priority.

For the purpose of this Resource Management Plan a provisional timber management strategy is proposed (section 3.7). This provisional plan is based on a review and qualitative analysis of available resource management objectives and recognises the best available stand and forest level timber resource information.

All subsequent tactical and operational planning requirements are based on the provisional strategy, and subject to modification upon completion of a strategic plan.

Timber Supply Projection

The Mackenzie TSA is undergoing preparations for a second Timber Supply Analysis during winter 1999/2000. The 1999/2000 Resource Management Plan is therefore based on the assumptions contained in the 1995 Timber Supply Analysis (TSR 1). At that time, uncertainties surrounded all of these assumptions influenced the accuracy of the timber supply forecast. Some of these uncertainties include:

- The nature of future public forest values and land use priorities
- The accuracy of the forest inventory
- The size of the timber production land base, and
- The prediction of regenerated stand yields.

These uncertainties remain, and combine with subsequent changes in the physical, biological, social and economic factors recognised in the TSR 1 analyses. The following strategic issues are considered most critical to the timber resource management:

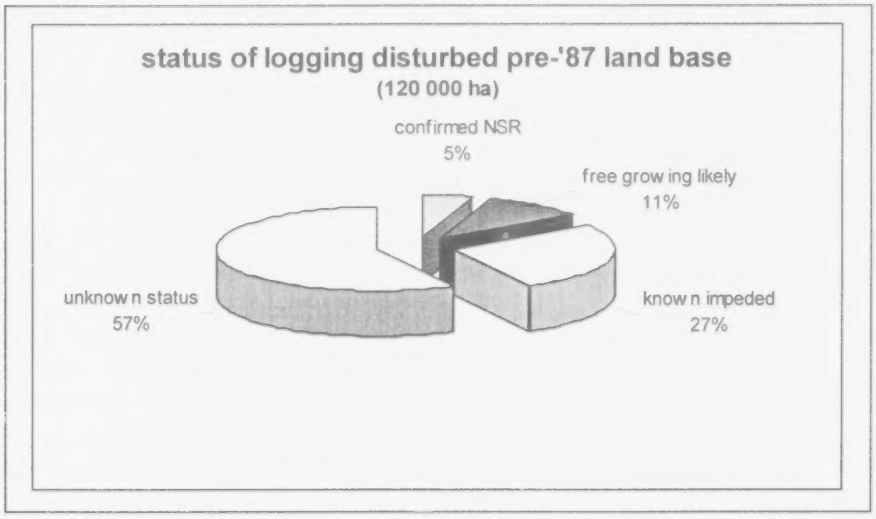

Figure 3.9 Silvicultural status of pre-'87 stands originating from logging disturbance.

Pre-'87 Stand Production

The latest inventory estimates of pre-'87 backlog in the TSA is 395 000 ha, or 13% of the productive forest land base (34% of the current harvesting land base. Of this total, 120 000 ha consists of sites disturbed by logging activity, and 275 000 ha are of wildfire origin (Figures 3.9 and 3.10). Of the combined total, 376 333 ha were assumed in the TSR

analysis to be contributing to the timber supply at a fully stocked, unimpeded rate.

In reality, many of these stands are marginally stocked with conifers and/or impeded by broadleaf vegetation, thereby producing coniferous timber a rate lower than may have been assumed. Current estimates (from Mackenzie District backlog database), for example, indicate that at least 32 000 ha of the logging origin pre-'87 land base requires some form of impeded stand release intervention. An additional 12 820 ha are classed as stocked via aerial photo stratification and interpretation, but require further ground checking to confirm free growing status.

69 300 ha requires stocking and/or free growing surveys to confirm their backlog status. Of this latter category, it is likely that a significant proportion is producing timber at less than an optimal rate. It may reasonably be assumed that up to 50 000 ha of the logging disturbed pre-'87 land base requires some form of impeded stand intervention to raise timber production to site productivity potential. In contrast to this large treatment requirement, only 9367 ha of the pre-'87 landbase has been brushed through various means since 1995.

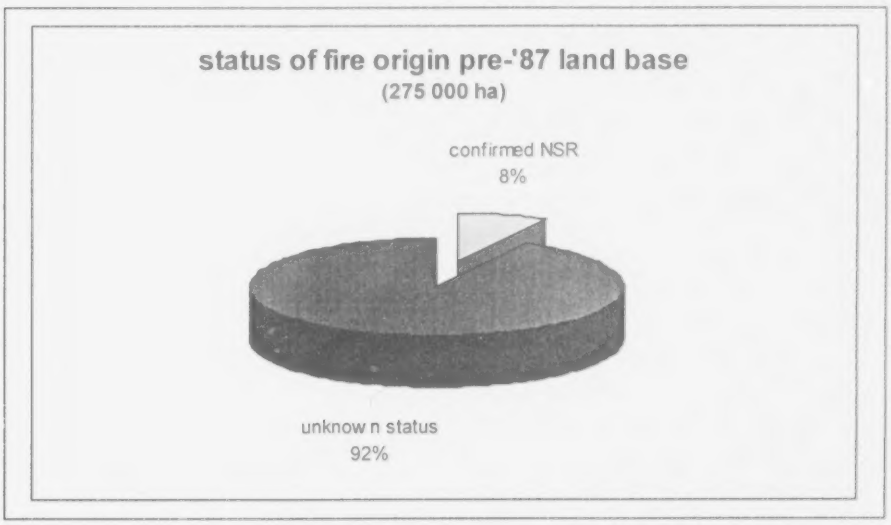

Figure 3.10 Silvicultural status of pre-'87 stands originating from wildfire disturbance.

Of the pre-'87 the fire origin pre-'87 land base, approximately 253 800 ha is of unknown timber production status. Aerial photo stratification and interpretation indicates that up to 70 000 ha of the combined logging and fire origin pre-'87 land base (376 333 ha) may be in a free-growing likely risk category, although ground confirmation must be undertaken to confirm this.

Restocking rate for Pre-'87 NSR

The estimate of logging disturbed, pre-'87 NSR assumed in TSR 1 was 18 677 ha . The analysis assumed this area would be re-stocked and returned to the productive forest land base by the year 2005. In reality, aerial photo stratification suggests that up to 12 300 ha of these stands may been restocked to minimum standards.

Of the remaining 5 900 ha, 2 150 ha have been restocked through planting and fill planting since 1995, but will likely require brushing investment to meet adequate levels of production. This follow-up intervention constitutes a legally binding silvicultural obligation.

Impact of Spruce, Pine and Balsam Beetles and Defoliators

TSR 1 assumed an annual rate of loss from insects, fire and windthrow at 290 000 m^3/year, of which up to 98 000 m^3/year would be salvaged. Since 1995, the actual rate of loss may have exceeded this assumption. Timber supply in the Mackenzie TSA is very sensitive to uncertainty regarding timber volumes in existing mature stands. For example, a 10% reduction in mature stand volumes has been shown to reduce the current harvest level by 20% .nearly 10 earlier than projected in the 1995 timber supply forecast. Uncertainty regarding the infestation level, pest population dynamics, or salvage and reforestation capability constitutes a serious issue for timber resource management.

Productive Potential of Regenerated Stands

Timber supply is quite sensitive to estimates of regenerated stand productivity potential. TSR 1 yield projections were based on the assumption that the site index of existing stands accurately reflected the productivity potential of future managed stands. Recent Old Growth Site Index (OGSI) studies suggest this assumption is weakest for medium, poor and low sites, and for lodgepole pine stands in particular.

There is now sufficient information to suspect that the actual site index of second growth stands in the Mackenzie TSA may be up to 20% higher than existing stands. However, this will translate into greater timber production only if adequate broadleaf vegetation control is maintained. Actual volume production will also vary depending on the level of stocking.

Another problem concerning the production potential of regenerated stands concerns pure stands of lodgepole pine. Regenerated lodgepole pine offer an enormous timber production potential in the TSA. Unfortunately, the species also suffers from a plethora of juvenile stand pests, the most serious of which are lethal infections of any of three species of stem rusts. These rust fungi can substantially reduce the volume production of plantations as well as pre-commercially thinned stands of natural origin.

Improved silvicultural tactics are required to deal with this serious timber production problem.

Summary of Strategic Issues

Previous assumptions regarding the scale and state of pre-'87 stands in the TSA may result in an earlier and more serious decline in AAC than projected in TSR 1. Uncertainties regarding the condition and yields of insect damaged residual stands may further impact the short and medium term timber supply. Underestimates of site productivity potential may partially offset these reductions, but only where adequate stocking and vegetation management is ensured. A silvicultural solution must be found for dealing with stem rust infections of young lodgepole pine stands, before the full timber production potential of this species can be realized.

5.3.3 Tactical Issues

Timber management tactics concern plans at a smaller scale, greater detail and shorter time frame, compared to a timber management strategy. Tactical design refines a timber resource strategy into treatment interventions suited to the specific stand and site conditions in the forest. Some of the factors considered in the design of tactics include:

- Site productivity potential
- Stand size and/or age
- Stand health and vigour
- Stand density of major and minor species
- Stand and/or site response to intervention
- Impact of interventions on other stand/forest values
- Site location and access
- Local availability of skilled forest workers

The following tactical issues have been considered in the 1999/2000 Resource Management Plan:

Tactical Design

Local tactical design and innovation is required to address special timber management problems. Most stand interventions are conventional applications of reforestation and stand tending treatments developed for average stand and site conditions. A considerable area of current and pre-'87 stands in the TSA occupy sites with special resource values, or consist of structural characteristics for which conventional silvicultural practices are ineffective, or inefficient. Innovative management tactics are especially needed for the following special situations:

- Riparian management and reserve zones
- Structurally complex stands (multi-layer, multi-species)
- Habitat feature preservation or enhancement
- High recreational value sites
- Special site or timber values

Development of prototype prescriptions, their evaluation and comparison with conventional treatments, and subsequent technology transfer to operations is required.

Stand Intervention Costs

The cost of most conventional stand intervention tactics has steadily increased since 1990 in the Mackenzie TSA (see Figure 3.11 and 3.12). It is not known whether this is a factor specific to Mackenzie, however unit costs for similar treatments in other regions and districts are often lower. In the face of rising unit costs (over $1000 for manual brushing and pre-commercial thinning, and $500 for aerial, chemical brushing) an analysis of cost versus effectiveness seems warranted. This will encourage selection, or development of tactics which are socially, biologically and economically justifiable.

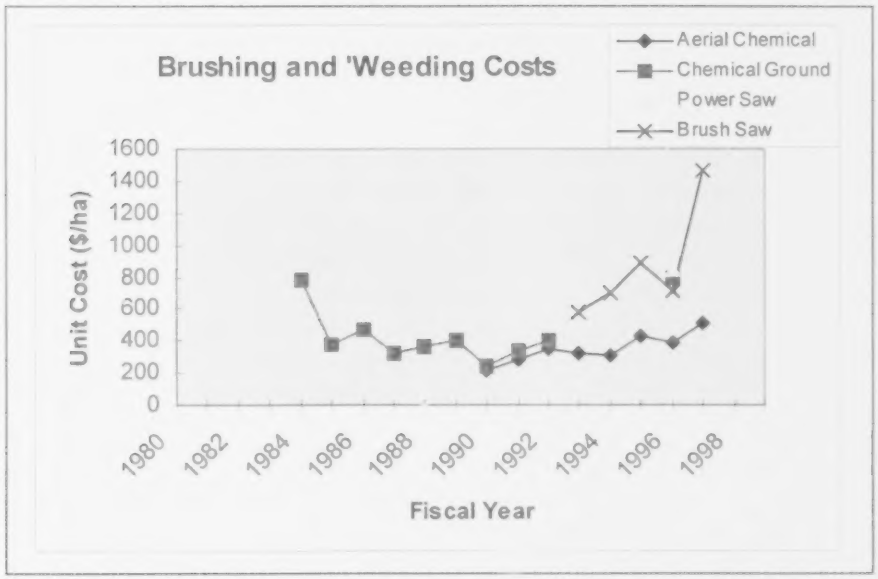

Figure 3.11 Unit costs for brushing and weeding interventions in the Mackenzie TSA

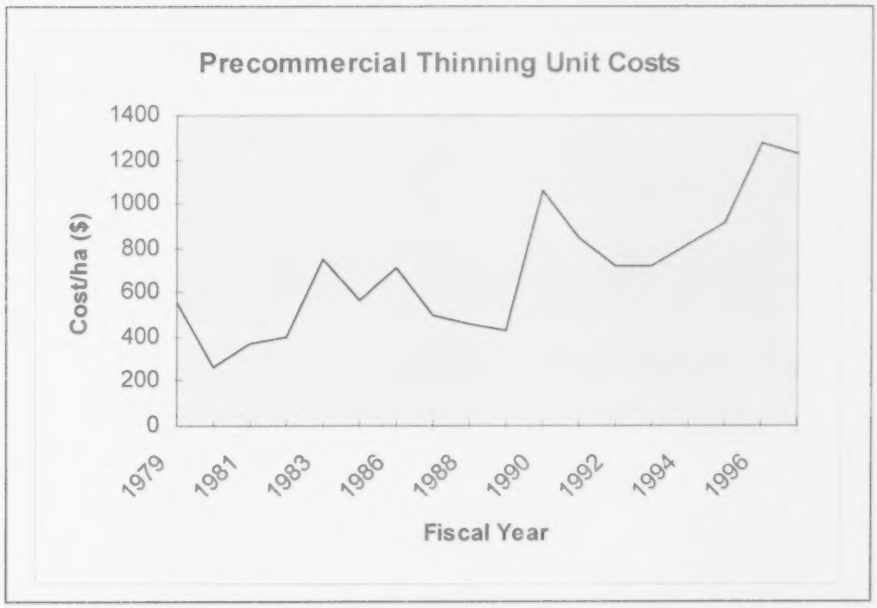

Figure 3.12 Unit costs for pre-commercial thinning in the Mackenzie TSA.

5.3.4 Operational Issues

Timber resource management requires an implementation schedule which identifies what site or stand interventions will occur at which locations in the forest, and at what time (i.e. forest development plans, logging plans, pest management plans, silvicultural plans). Silvicultural planning involves the operational scheduling of stand level interventions based on tactical plan and a guiding forest level strategy (i.e. silvicultural prescriptions, stand management prescriptions, silvicultural treatment prescriptions, pesticide use permits). This schedule is implemented operationally, based on the availability of funds. The following operational issues apply to the Mackenzie TSA:

Operational Planning

> An operational planning system was developed for the Mackenzie Backlog Program during 1995-98. An operational plan was prepared annually for implementation by Forest Renewal Partners. Since 1998, however, the backlog operational plan has been deferred. By default, the annual investment in site and stand interventions during 1998 and 1999 has relied on a surplus of prescriptions and permits from previous annual plans. It is essential that operational planning for this activity resume in 2000/2001 to ensure the effectiveness and efficiency of investments, and availability of budget resources.

5.3.5 Adaptive Management Issues

Timber management relies on many assumptions, biological projections and forecasts of future values, all of which incorporate uncertainty. Determining a strategy, designing the most effective tactics, and implementing a sound operational plan is no guarantee of successful management. Performance monitoring is necessary to determine the success or failure of all these elements of management, and to determine whether resource management goals and objectives are being achieved.

The most immediate adaptive management issue of significance in the Mackenzie TSA is provision of a treatment evaluation system. Preliminary treatment performance monitoring was conducted in 1998, but a continuous scheme of evaluation and management feedback is required to ensure investment programs are meeting the strategic needs of the TSA.

5.4 Incremental Silviculture History

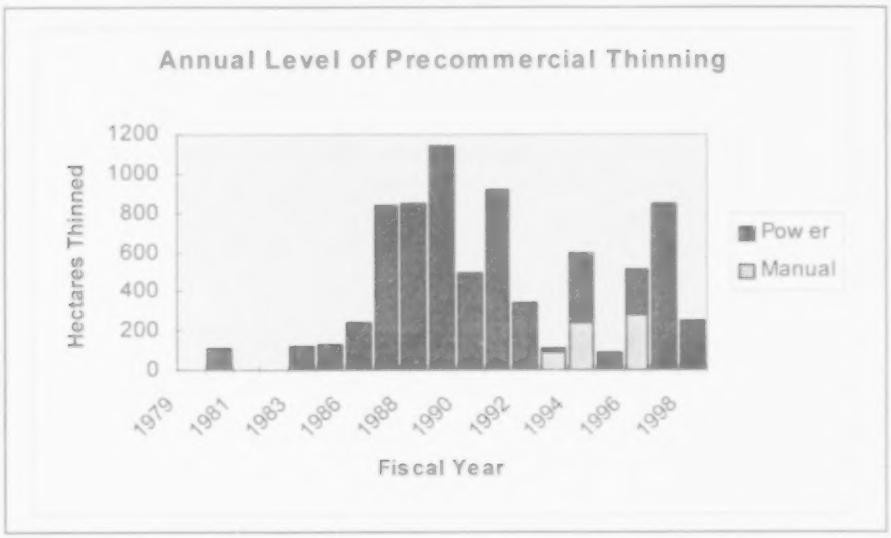

Figure 3.13 Scale of annual pre-commercial thinning interventions in the Mackenzie TSA

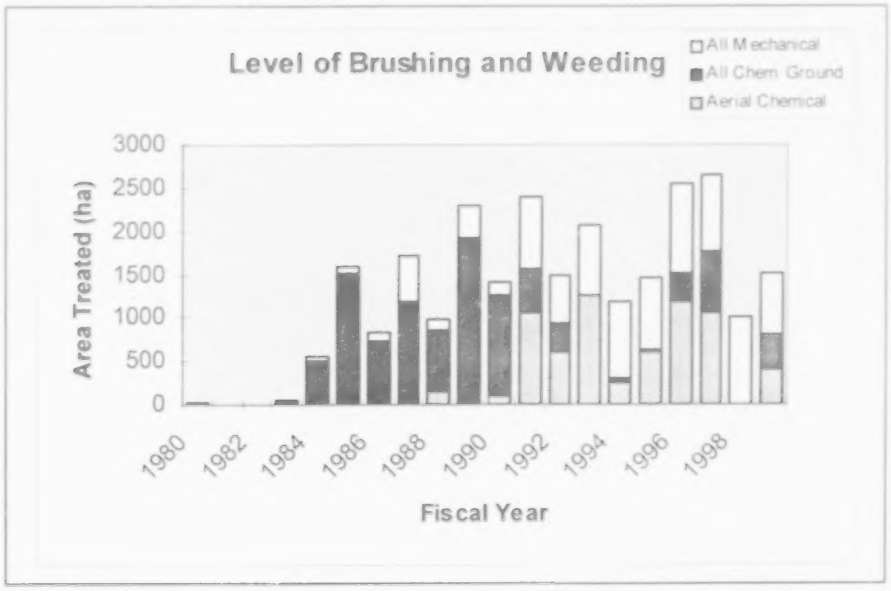

Figure 3.14 Scale of annual brushing and weeding interventions in the Mackenzie TSA

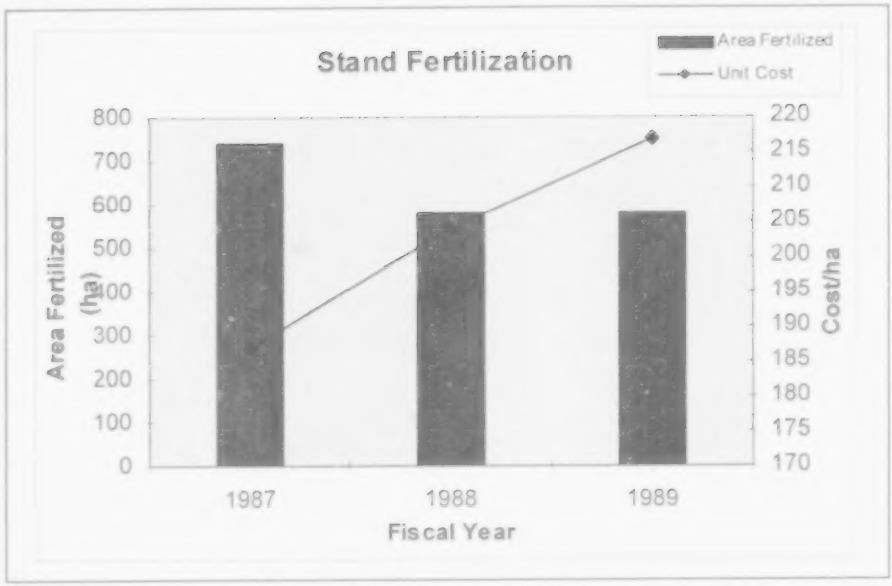

Figure 3.15 Scale of annual stand fertilization interventions in the Mackenzie TSA

The incremental (i.e. other than harvesting and artificial reforestation) silvicultural history of the Mackenzie TSA began in 1980 with a small program of brushing and weeding and pre-commercial thinning. Since 1980 the following investments have been made:

Brushing and Weeding (all methods) -	23 918 ha
Pre-commercial Thinning (all methods)-	7 600 ha
Stand Fertilization	1 900 ha
Total area treated	33 418 ha

While some proportion of this investment was directed at basic silviculture obligations, the majority of these treatments were incremental in nature. An assumption was made in the previous timber supply review that little incremental silviculture had been practised in the Mackenzie TSA. This is clearly not the case. In excess of 1 million dollars has been invested in pre-commercial thinning of lodgepole pine stands alone between 1980 and the end of 1998. Brushing investments during the same period amount to over $11 100 000 to the end of 1998. Fertilization investments amount to a modest $126 000.
Despite this large total investment over nearly 20 years, little in the way of biological monitoring of results has been undertaken. A modest sampling project was initiated in 1998, however much more scrutiny of treatment results is necessary to facilitate an adaptive management feedback loop (see section 5.3.5, adaptive management issues).

5.5 Opportunities to Increase Timber Supply

In the absence of either a clear definition of local timber management objectives, or a forest level strategic analysis, the following management goals have been used to evaluate opportunities to increase timber supply in the Mackenzie TSA:

- Maintain current harvest levels for as long as possible without sacrificing the long term level of timber supply in the TSA.
- Minimize the scale and duration of the interim, mid term short fall in harvest level.
- Ensure that all considerations, assumptions and needs specified in the 1995 Timber Supply Review (TSR 1) are addressed.
- Identify all potential timber management opportunities, and employ the full range of applicable silvicultural activities.

The following review of potential strategic opportunities is based on inferences from the 1995 Timber Supply Review (TSR 1).

5.5.1 Opportunities to Reduce Harvest Age

Evidence from the 1995 TSR indicates that timber supply is sensitive to the minimum harvest age of regenerated stands. Minimum harvest age is an estimate of the time needed for a timber stand to reach a merchantable condition. The TSR employs a definition of minimum harvest age based on the culmination age, or point of maximum mean annual increment (MAI) of the stand. This definition ensures the long term production level of the TSA, since harvesting at stand culmination age maximizes forest yields over successive rotations.

The minimum harvest age for regenerated stands in the Mackenzie TSA is the age at which 95% of maximum MAI is achieved, based on the yield projections of even-age, fully stocked and free-growing, single species coniferous stands. The 1995 analysis indicated that short term timber supply was extremely sensitive to a decrease in minimum harvest age. Figure 3.16 illustrates how decrease of 10 years in the minimum harvest age of all regenerated stands could maintain the current level of harvest over the next 65 years, three decades longer than the base case. This would be followed by gradual decline to a long term sustainable harvest similar to that of the base case.

Figure 3.16 Potential effect on timber supply of a 10% decrease in the minimum harvest age.

Minimum harvest ages for good and medium site spruce and pine stands in the TSR ranged from 55 to 95 years. Two important assumptions are inherent in these harvest ages, however:

- Stands have not been subjected to impeded early growth due to competing vegetation (impeded early stand growth delays the culmination of MAI).
- Stocking and density values are optimized for each species (i.e. low stocking densities increase culmination age).

Where both assumptions are valid, reducing minimum harvest ages could increase the mid term level of timber supply, thereby reducing the scale and duration of supply reductions. However, where either or both assumptions are invalid, timber supply may have been over-estimated, requiring immediate attention to actual management practises in the TSA if long term supply is to be maintained.

For example, Figure 3.17 illustrates a situation where minimum harvest ages are actually 10 years longer than assumed in the base case. This would drop the current annual harvest rate in 2005 to a rate 5% lower than the base case reduction (see Figure 15). The lower rate of harvest throughout the mid term is also prolonged several more decades relative to the base case. In the long term, increased harvest age results in an overall 7% reduction in future timber supply.

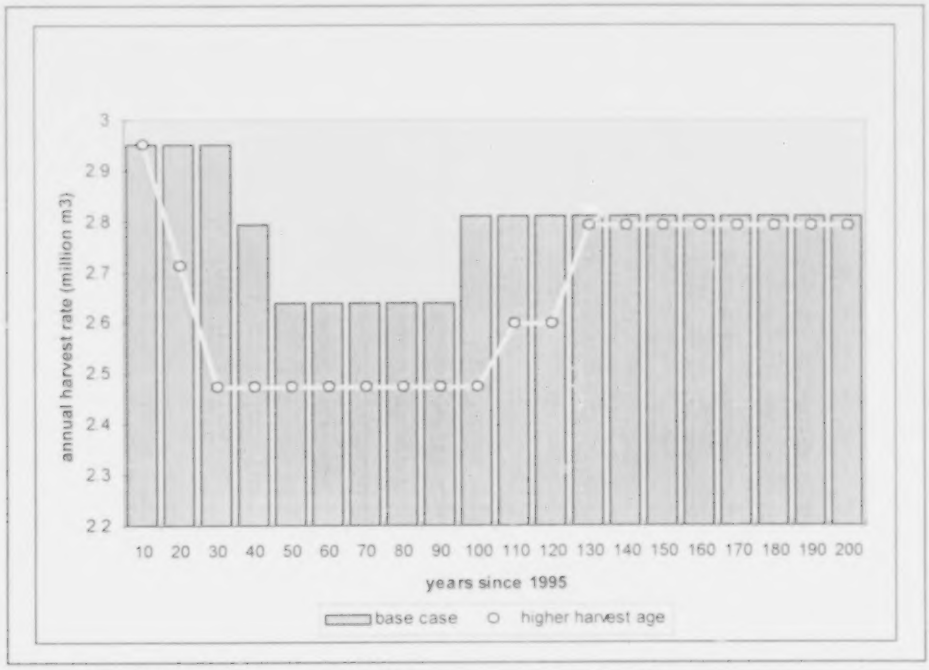

Figure 3.17 Potential effect on timber supply of a 10% increase in minimum harvest age.

Five possible options exist to reduce actual minimum harvest ages, either to increase the existing forecast of timber supply, or to reduce the downward pressure resulting from invalid management practice assumptions in the previous supply analysis:

Pre-87 Impeded Stand Release

For the purpose of this analysis, it is assumed that approximately 106 800 ha of pre-`87 logging disturbed stands were included in the TSR 1 current harvesting landbase, thereby contributing to timber production at an unimpeded, optimum level of stocking. These regenerated stands resulted from the earliest logging disturbance in the TSA, and therefor likely represent a higher than average proportion of the best sites. It is likely, however, that the stocking of these stands is minimal, and growth is impeded to some degree by broadleaf vegetation (largely trembling aspen, black cottonwood, paper birch, Sitka alder and willow of various species). Under these conditions, it is equally likely that the minimum harvest age of many of these stands will exceed that of adequately managed stands by 10% or more.

For example, Figure 3.18 illustrates the theoretical yield of a backlog spruce stand growing under two different silvicultural regimes; adequately brushed and un-brushed. In the adequately brushed stand, the culmination of MAI occurs at 85 years, similar to the assumptions inherent in the 1995 TSR. In comparison, the brush dominated stand illustrates the lower production rates expected in the first

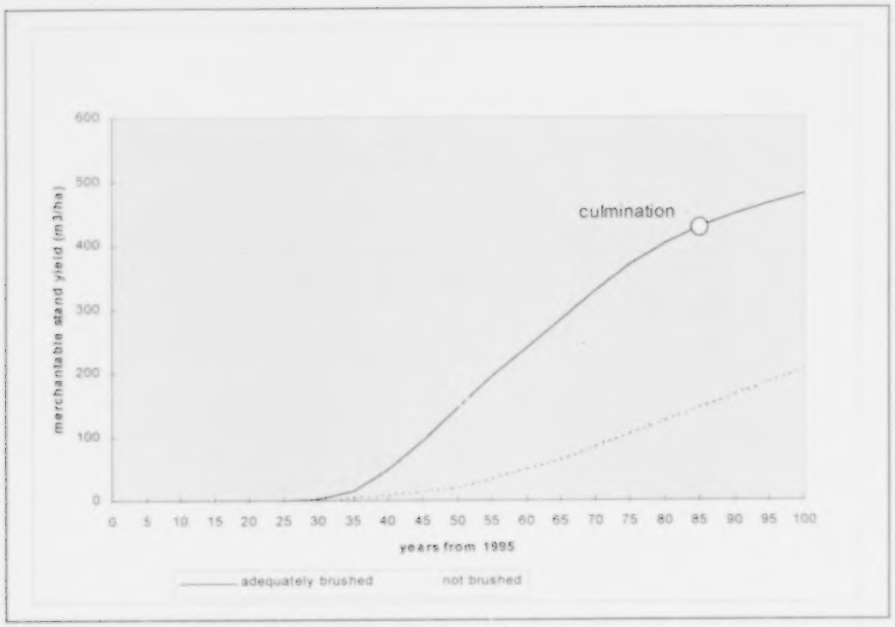

Figure 3.18 Theoretical yield forecasts for a pre-'87 white spruce stand of site index 20 m reflecting: 1. An adequately brushed condition; and 2. A broadleaf vegetation impeded condition.

50 years due to overtopping broadleaf species, and the lower rate of production between 50 and 100 years due to fewer surviving crop trees, and gradual emergence from broadleaf cover. The culmination age of the un-brushed stand is not expected before 120 years.

The large area of this forest component (up to 9% of the current harvesting land base suggests that potential negative impacts on medium term timber supply projections may be substantial. For this reason, efforts to reduce vegetative competition in pre-87 stands may be the most effective strategy capable of offsetting these supply reductions

Basic Silviculture

Achieving basic silviculture obligations ensures the validity of harvest age assumptions. Full, target stocking levels should therefore be the basic silviculture strategy, coupled with an aggressive vegetation management strategy to ensure early growth and stand production is maximized. If actual basic silviculture achievements fall short of this performance, an estimate must be made of the impact on harvest age and volume production assumptions in order to adjust future timber supply projections.

Current Reforestation

The prompt reforestation of areas denuded by fire or pests (where no salvage harvesting occurs) offers a good opportunity to considerably reduce future stand harvest ages relative to natural regeneration processes. If actual unsalvaged losses over the past 5 years equal that assumed in TSR 1 (area equivalent of 192 000 m3/yr), current reforestation will contribute to an increase in timber supply. If actual losses have exceeded assumptions, current reforestation will help to minimise the resulting downward adjustment in mid term supply.

NSR Restocking

Of the 37 024 ha of NSR factored into TSR 1 analyses, 50% (18 677 ha) was assumed to be in pre-'87 stands. The current portion was assumed to be restocked according to managed stand regeneration delays (3 yrs), and the pre'87 NSR was assumed to be re-stocked and returned to the productive forest land base by the year 2005. Recent aerial photo stratification now suggests that up to 12 300 ha of the pre-'87 stands may actually be stocked to minimum standards.

Of the remaining 5 900 ha, 2 150 ha have been restocked through planting and fill planting since 1995, and will likely require brushing investment to meet adequate levels of production. Assuming that basic silviculture performance is being met for current NSR, the inference is that pre-'87 NSR restocking will likely contribute very little to gains in timber harvesting landbase.

Greater gains may accrue more cost-effectively from surveys to confirm the SR status and expected production levels of the 12 000 ha now believed to be restocked. Similar cost effective gains may be made through surveys aimed at confirming the approximately 70 000 ha of logging and fire origin stands suspected to be free growing.

Pre-87 Pre-commercial Thinning

There is approximately 180 000 ha of fire origin, pre-'87 stands in the Mackenzie TSA, many of which are overstocked stands of lodgepole pine. Many of these stands are beyond their biological window of thinning opportunity, meaning that pre-commercial thinning interventions are unlikely to accelerate stand development as a means of reducing the time to merchantability. This strategy, in combination stand fertilisation, should be explored to determine what biological potential exists.

Large scale thinning, or thinning and fertilisation of these stand types should not be implemented unless the stand level biological potential is favourable, and a strategic analysis identifies thinning as a key investment.

5.5.2 Opportunities to Increase the Volumes in Regenerating Stands

In 1995 there was considerable uncertainty regarding the actual productivity potential of sites in the Mackenzie TSA. The range of actual site productivity potential in the Mackenzie TSA is now known to be higher than assumed in the 1995 analysis, particularly for medium and poor site classes. Increases for these classes in the order of 2 to 3 m of height @ 50 years is now seems likely. Sensitivity analyses were performed in 1995 to explore the significance of the uncertainty.

Timber supply sensitivity to increases in actual site productivity (hence yield) were found to be modest in the mid term. Figure 3.19, for example shows the effect on harvest rate of a 25% increase in the volume of regenerated stands. No improvement is evident in the short term, and a 7% increase in harvest rate between 50 and 100 years from now. Substantial gains in potential harvest accrue in the long term. This effect, however, is the result of a 25% increase in yields, an increase very unlikely to be experienced in reality.

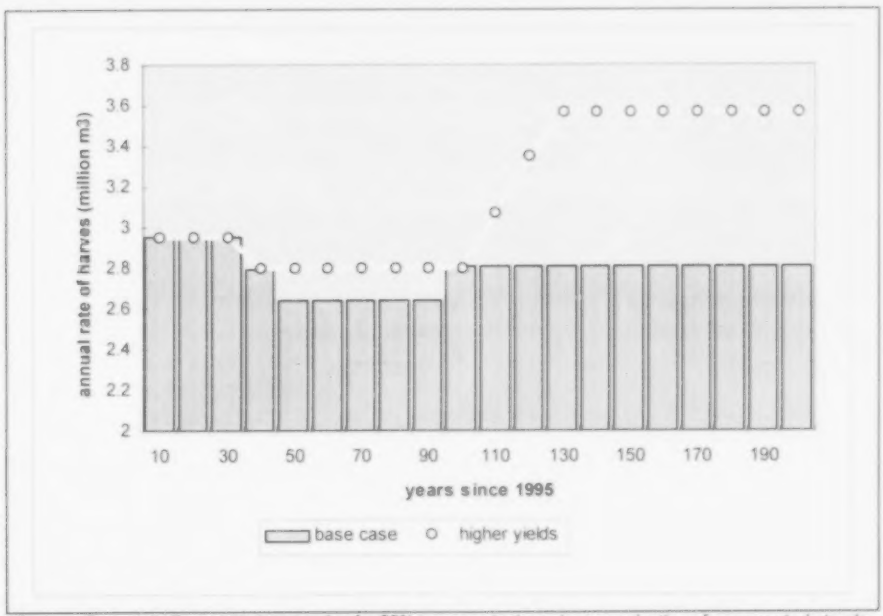

Figure 3.19 Potential effect on timber supply of a 25% increase in the volume production of regenerated stands.

Three options exist to increase stand volume production, although the potential impact on timber supply are likely to be more modest than indicated in Figure 3.20.

1. Improved Estimates of Site Productivity Potential

   Improved estimates of site productivity potential may partially alleviate the mid term decline in timber supply. However, this will only be possible given adequate silvicultural management. Optimum stocking and adequate brush control

measures are as crucial to stand volume production as they are to minimum harvest age, and culmination age. This applies equally to current and backlog stands in the TSA. Figure 3.20, for example, illustrates the difference in stand yields associated with a 3 m difference in site index. The theoretical yield of the site 20 stand is only 18% greater than that of the site 17 stand.

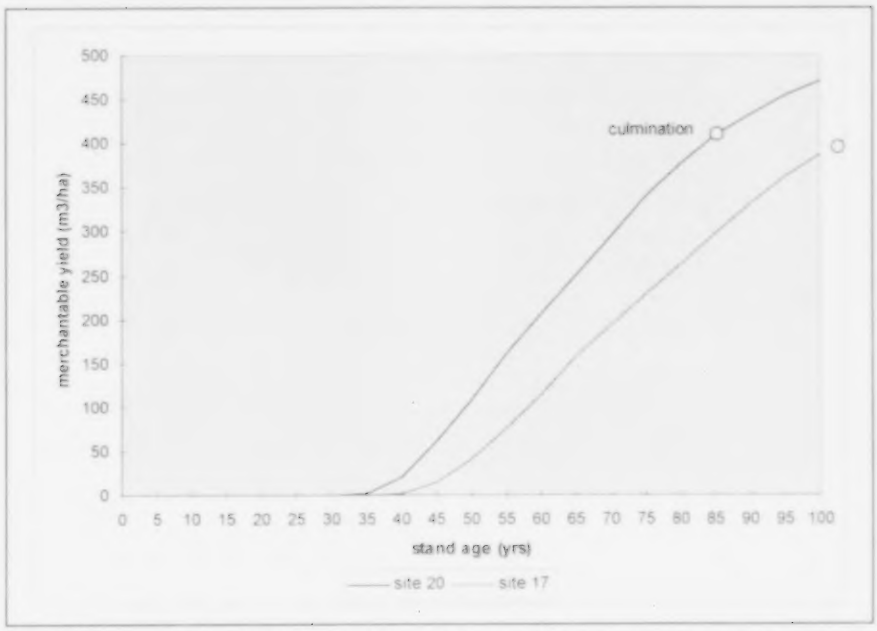

Figure 3.20 Theoretical production and culmination ages of a white spruce stand at optimum stocking (1400 sph) growing at two levels of site productivity potential.

2. Improved Rate of Stand Volume Production

It is difficult to alter the biological growth potential of a stand. Nevertheless, stand fertilisation may offer a potential means of increasing volume production, reducing the culmination age (and harvest age), or both. Implementing such a strategy at a scale necessary to achieve desired forest level timber supply results demands more thorough analysis and modelling than this RMP can provide. It is recommended, however, that stand fertilisation be explored at an appropriate scale to provide the necessary experience, knowledge, and biological response information for future analyses.

3. Minimising Pest Losses in Regenerated Stands

A second variant of the former strategy is minimising regenerated stand volume losses due to juvenile stand pest damage and mortality. Volume losses are particularly serious in juvenile lodgepole pine stands which are infected in excess of 20% with any of three species of lethal stem rust fungi. Reducing, or avoiding these losses could have a similar effect on timber supplies as increasing the level

of stand volume production. This strategy should be explored to develop appropriate tactical measures.

5.5.3 Opportunities to Increase the Volumes in Existing Stands

As described in Strategic Issues (section 5.3.2) timber supply in the Mackenzie TSA is very sensitive to uncertainty regarding timber volumes in existing mature stands. Degradation of residual stand volumes due to epidemic bark beetle and defoliator damage and mortality could have a substantial impact on mid term timber supply.

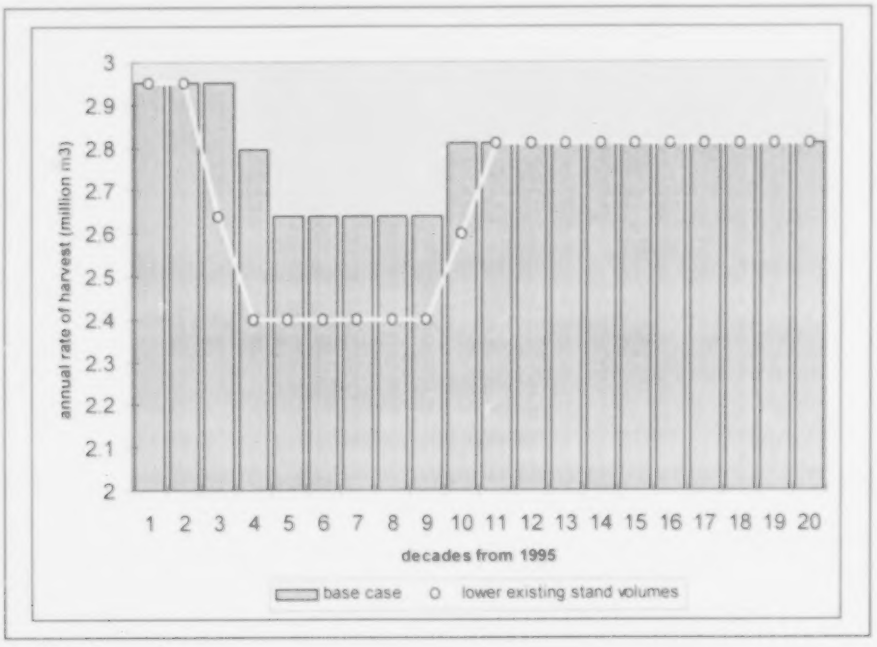

Figure 3.21 Potential effect on timber supply of a 10% reduction in the volume of existing stands.

Figure 3.21 illustrates that timber supply is very sensitive to uncertainty in the volume estimates of existing stands. TSR 1 analysis found that if existing volumes are overestimated (as a result of pest degradation, for example), the current harvest level would have to decline nearly 20% below base case levels after 2015. Long term harvest levels would also be approximately 8% lower to avoid timber supply shortages.

It is clearly infeasible to prevent epidemic pest losses. However, accelerated salvage strategies and prompt reforestation of highly impacted stands may offer a means of minimising the downward impact on timber supply.

5.5.4 Opportunities to Reduce Regeneration Delay

Sensitivity analyses indicate that timber supply is moderately affected by changes in the regeneration delay used in the TSR (three years). Figure 3.22 illustrates the impact of eliminating the regeneration delay. Short term harvest level could be maintained for an additional decade compared to the base case, and the mid and long term harvest levels would increase by 8.7% and 3.4%, respectively. It is, however, unlikely that regeneration delays could be reduced below 1 year.

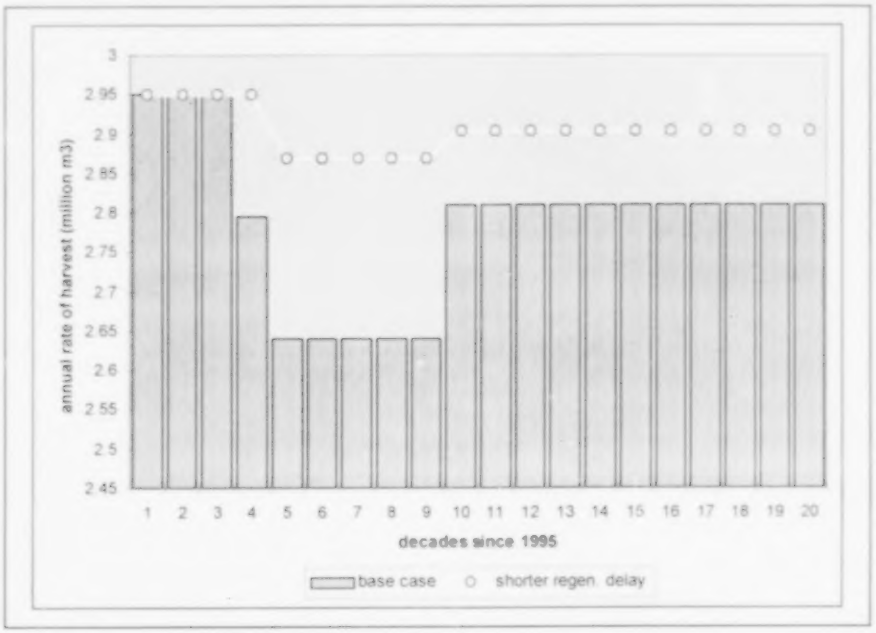

Figure 3.22 Potential effect on timber supply of a 3 year reduction in regeneration delay

Figure 3.23 illustrates the potential negative effect of doubling the regeneration delay period to 6 years. Mid term short falls would occur by 2015, and be approximately 1.7 % lower than the base case. The long term harvest rate would decline by approximately 4.5%. Clearly, every effort must be made to minimize the regeneration delay.

A realistic strategy would be to aim for 1 to 2 year regeneration delays in the basic silviculture program, and no more than 3 years in the current reforestation program, wherever possible.

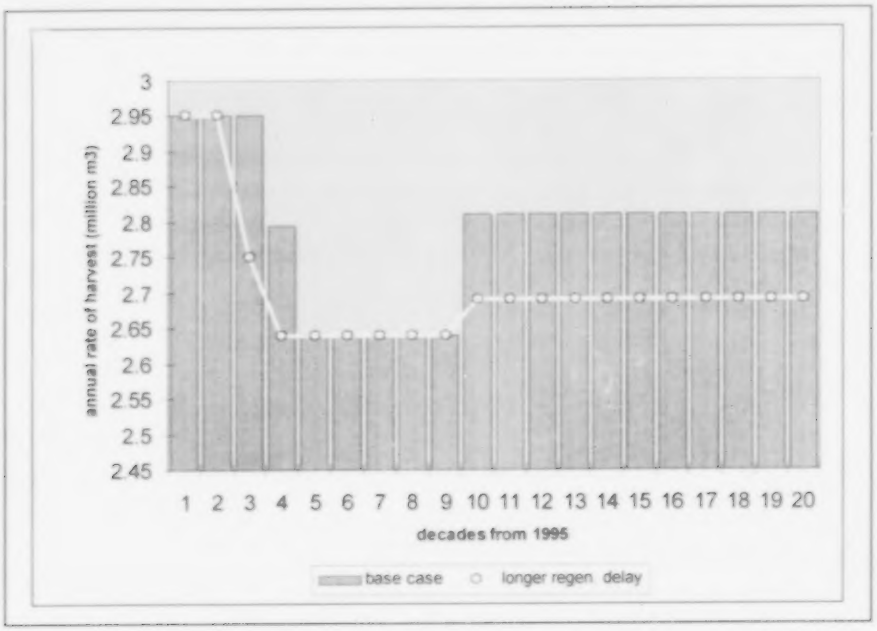

Figure 3.23 Potential effect on timber supply of a 3 year increase in regeneration delay

5.5.5 Opportunities to Increase the Harvesting Landbase

During the 1995 timber supply analysis of the Mackenzie TSA there was considerable uncertainty about the size of the timber harvesting land base. The actual operability of the northern portion of the TSA was estimated using experience gained in the southern portion, since actual operability had not been classified. Because of these and other uncertainties, the sensitivity of supply to changes in the timber production land base was tested.

Supply sensitivity was modest to increases of as much as 10% in the timber production land base. Figure 3.24 illustrates the impact of increasing the land base by just 5%. The rate of decline of the current harvest rate is lower in the mid term, and the long term harvest rate returns to the current level. A 5% increase in harvesting land base, however, assumes that about 58 000 ha of additional production could be brought on-stream.

Three potential options for securing additional timber harvesting area are:

- Reforest NCC stand types with commercially useful species.
- Convert currently NCBr sites SR status and full production.
- Rehabilitate currently excluded roads and landings to full production

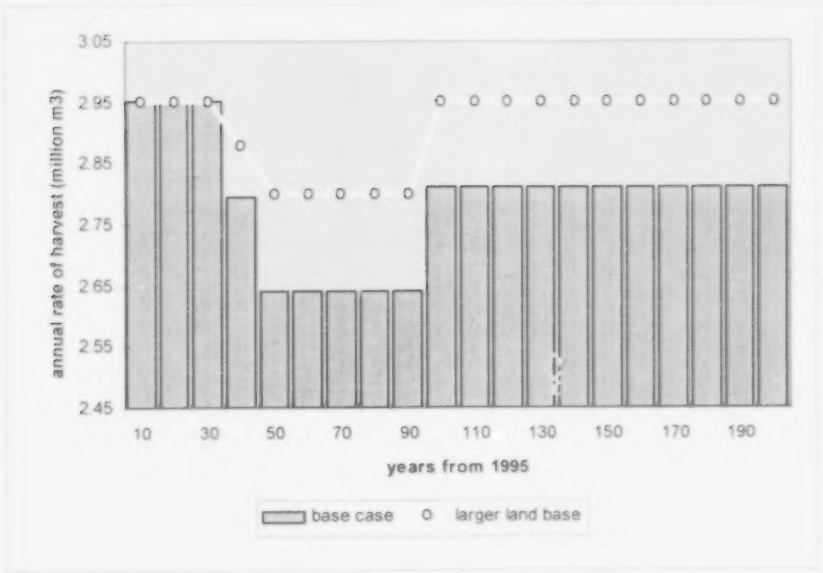

Figure 3.24 Potential effect on timber supply of a 5% increase in the area of the current timber harvesting land base

Restocking of Non-Commercial Brush and NCC Stands

The anticipated scale of Backlog Aforestation is unlikely to have a significant impact the timber supply. For example, a maximum of only 10 000 ha of NCBr stands may be available for aforestation.

Rehabilitation of Roads and Landings

Another potential strategy aimed at increasing the harvestable land base is an accelerated program of landing rehabilitation. Landing areas removed from production and timber supply projections, and suitable for improvement in timber growing potential amount to fewer than 1000 hectares, according to most recent estimates. It is unlikely, therefore, that landing rehabilitation activities have significant strategic value in the Mackenzie TSA.

5.6 Opportunities to Improve Timber Quality

From a timber resource quality perspective it is not possible to formulate a timber quality strategy at this time. Forecasts of future timber market conditions are necessary in order to evaluate the economic efficiency of various silvicultural activities. Because the return on silvicultural investments will not be obtained for 40 to 100 years in the Mackenzie TSA, these forecasts are fraught with uncertainty. A clearer statement of future timber price assumptions is necessary.

As discussed in the Ministry of Forests publication "Guidelines for Developing Stand Density Management Regimes", considerable debate surrounds the criteria used to categorise current timber quality, as well as assumptions regarding future measures of quality. Currently, for example, a large log commands a higher price per cubic metre than a small log, all other wood quality characteristics held constant. This price premium is due to the larger dimension, and usually more highly valued products that can be manufactured from large logs, as well as the higher product recovery rates associated with a larger piece size.

Many other characteristics influence the price of a log. A number of factors affect the quality characteristics of a log, most notably the density regime of the stand. Log taper, knot size and distribution, number of growth rings per inch, and the proportion of lower strength juvenile wood are all affected by the inter-tree density throughout the development of the stand.

As second growth timber gradually replaces original growth stocks of timber in the TSA, log dimensions are expected to decrease. Constantino and Haley (1988) reported the average rate of decrease in wood quality attributable to changes in species and grade composition averaged 0.14%/year in BC during the period 1925 to 1990. Whether the price premiums associated with larger piece sizes will be maintained in the future depends on how future markets will value piece size and stand density related wood quality characteristics.

Feltham and Messmer (1996) reviewed historical timber price trends in British Columbia and determined that future prices will likely increase at a declining rate into the future. There is no evidence to suggest that the prices of different species and grades would change at a different rates. A number of factors are likely to compensate for the effects of smaller, lower quality timber on the future timber market. Changes in harvesting systems, manufacturing processes and wood products design will likely encourage better utilisation of small dimension logs and greater wood recovery from each stand, higher recovery rates during manufacturing, and greater use of engineered wood products as substitutes for larger dimension timber components. Similar compensating strategies will likely take place in the Mackenzie TSA in the face of future scarcity of current species and grades.

TSR 1 was silent on the topic of timber quality, and most statements of forest level objectives are too vague, or inadequate to develop a timber quality strategy at this time. For this reason, no attempt has been made to define future forest product objectives or opportunities to meet them. To do so, in the face of so great a degree of uncertainty,

would risk misdirecting scarce silvicultural funds away from known and more immediate investment needs.

5.7 Opportunities to Improve Habitat Supply

The current structure and future dynamics of the whole forest determines the availability and sustainability of all forest values, and the degree to which forest level objectives are achievable. The supply of forest habitat is no exception. Habitat is related to one or a combination of the following factors:

- a specific stand type,
- a specific pattern of stand types,
- a specific stage of stand development, or
- a specific pattern of stand development stages.

Preservation or enhancement of forest habitat and biodiversity depends on a perpetual mosaic of stands with a variable and complimentary stand structure throughout a forest.

Habitat and other non-timber objectives are contained within the Mackenzie LRMP and considered in TSR analysis reports, however objective units of measurement are not currently specified. Most forest management constraints for specific habitat values are static (not dynamic), and can only be accommodated through stand level resource policies and guidelines.

A current Ministry of Forests research initiative is aimed at exploring methods of modelling the effects of silvicultural interventions on habitat supply at the landscape and forest level. This initiative, funded by Forest Renewal BC at the provincial level, will establish what existing information, methodology and models could be accessed to input to the "habitat supply implications" component of silvicultural strategies. Regional forest and wildlife ecologists will be involved in reviewing the project plan, before proceeding with any analyses of the habitat supply implications.

Experience in the Pacific Northwest suggests that some of the US information could be applied immediately to habitat supply analyses in British Columbia. Much of the information can be adjusted to apply directly to southern BC. However, until such time that similar methods can be applied in the Mackenzie TSA, every effort should be made during local forest use planning to establish explicit resource user requirements (resource type, quantity, quality, location and timing). Without this information, uncertainty will exist at all subsequent stages of forest management and silvicultural decision making.

The required level of resource planning detail will no doubt evolve and improve over time. In the meantime, however, it is not prudent set forest management strategies in the absence of clear objective detail.

5.8 A Provisional Strategic Plan for Timber Resource Management

This strategic plan for timber resource management is directed at fulfilling the following perceived timber supply objectives:

1. Maintaining current harvest levels for as long as possible without sacrificing the long term level of timber supply in the TSA.
2. Minimizing the scale and duration of the interim, mid term short fall in harvest level.
3. Maintain forest structure and health to ensure the Mackenzie TSA is capable of fulfilling the biological, economic and social objectives of management, for the greatest common good.
4. Employing silvicultural interventions which are fiscally responsible, enhance biodiversity, create present and future employment, promote community stability and enhance timber supply.

These interim objectives will serve as working targets for timber quantity, until management objectives are defined in more specific, and measurable terms.

The following 7 strategies all contribute to achievement of these interim objectives. Based on existing information, however, some are identified to be of greater, key importance to TSA timber resource supply needs than others. All are listed in order of their perceived importance:

Key Strategies:

1. Undertake a strategic silvicultural analysis of timber resource supply.
2. Reduce the minimum harvest age of pre-87 impeded stands.
3. Accelerate reforestation efforts.
4. Improve pest detection, control and salvage capability.

Minor Strategies:

1. Maintain or improve basic silviculture performance.
2. Increase regenerated stand volume production.
3. Increase the timber harvesting land base.

Collectively, these strategies constitute the "provisional" strategic plan for Timber Resource Supply objectives in the Mackenzie TSA, and guide all subsequent tactical and operational planning priorities. This provisional strategy may be modified at such time as a strategic analysis indicates a change of strategy is warranted, or until forest management objectives change or become more clearly defined.

5.8.1 Strategies by Response Time Frame

Strategy 1 – Strategic Analysis and Planning

This is a strategic planning initiative rather than a stand intervention initiative. A strategic silvicultural analysis, linked to TSR 2 timber supply analysis, is of key importance in guiding future silvicultural investments in the Mackenzie TSA. Strategic planning undertaken now will ensure that appropriate silvicultural interventions are selected, thereby maximising the cost/forest benefit for timber management objectives. Until this analysis and plan are undertaken, the provisional strategic plan must be used to guide silvicultural investment, with an greater attendant risk of implementing inappropriate tactics and investments.

Strategy 2 – Pre-'87 Impeded Stand Interventions

This is a key stand intervention, and the most likely strategy to improve timber supply in the short term. Overall, there may be a greater likelihood that the 1995 timber supply forecast was optimistic (see section 3.2 Timber Supply Projection). Impeded stand release interventions are the most effective means of maintaining the current harvest level for an additional two decades. Few other strategies are capable of this short term, ameliorating effect.

Strategy 3 – Accelerated Reforestation

This is a key stand intervention potentially capable of reducing the impact of potential downward pressure on the medium term timber supply. Assumptions regarding the rate of reforestation of pre-'87 and current NSR will likely be optimistic without an increased reforestation program.

Strategy 4 – Pest Management Detection and Intervention

This is a key strategy aimed at reducing short and medium term downward pressure on timber supply caused by current epidemic pest populations in the TSA. This strategy has little or no effect on long term timber supply.

Strategy 5 – Achievement of Basic Silviculture Performance

Failure to implement this "default" strategy has the potential to impose short and medium term downward pressure on timber supply. It is critical, therefore, that the basic silvicultural assumptions contained in past and future timber supply analyses be implemented in the TSA.

Strategy 6 – Increasing Regenerated Stand Volume

This strategy has the potential of influencing only long term timber supply. An important caveat, however, is that stand intervention tactics

must be correctly selected, and correctly applied at the stand level. This strategy therefore requires investment in greater understanding of the volume enhancement potential of a number of potential tactics, before large scale implementation is considered.

Strategy 7 – Increasing the Timber Harvesting Land base

This strategy has the potential to increase both medium term and long term timber supply, but only at a scale of implementation which is currently infeasible. Harvesting and manufacturing innovations over the next few decades may contribute more to a greater "economic" harvesting land base than short term stand interventions.

5.9 Recommended Tactics and Intervention Targets

This section describes the preferred tactics for implementing each of the strategies of the provisional strategic plan

5.9.1 Strategy 1 – Strategic Silvicultural Analysis and Planning

Strategic silvicultural planning should be undertaken in concert timber supply planning during winter 1999/2000.

Recommended Tactics:

Forest Renewal BC have allocated funds to the Prince George Forest Region in support of two types of strategic planning:

Type 1 Forest Estate Planning

This tactic employs a similar approach as taken in the preparation of this RMP. A timber supply planning consultant will facilitate a series of planning meetings in up to six forest districts, and prepare background information from all available sources. The product of this planning exercise will be a "provisional" silvicultural strategic plan.

Type 2 Forest Estate Planning

This employs a similar pre-planning exercise as type 1 (above), supported by forest estate modeling using the current TSA inventory, and silvicultural assumptions developed by district stakeholders. The product of this planning exercise will be a silvicultural strategic plan, and a basis for most silvicultural investment decisions in the TSA.

It is recommended that the Mackenzie TSA undertake a Type 2 analysis during the winter of 1999/2000. The cost of this exercise will be approximately $75 000, and the involvement of licensee and ministry silviculturists. If Mackenzie is selected, costs will be covered by Forest Renewal BC, outside of annual and multi-year contract funds.

5.9.2 Strategy 2 – Pre-'87 Impeded Stand Interventions

Recommended Tactics:

Three, key inter-related tactics are required to implement this strategy:

1. Pre-'87 Tactical Planning

   At the present time, there is little more than anecdotal evidence concerning the efficacy of various intervention tactics. Conventional tactics available include:

   - aerial, broadcast herbicide applications; ground, broadcast herbicide applications;
   - ground, selective herbicide applications (basal spray, basal frill, cut stump);
   - manual or motor-manual cutting treatments.
   - Manual or motor-manual girdling treatments.

   Choice of tactic is often determined by non-timber values, such as proximity to water bodies, terrestrial habitat or viewscape features and human food gathering habits. Until differential efficacy information is available, no biological differences between treatments in similar stands will be assumed. It is recommended, however, that efficacy monitoring of all conventional tactics be undertaken (see Adaptive Management Tactics) as soon as possible to guide future tactical analysis of intervention options.

   Impeded stand interventions are problematic on many sites with special resource values, or in stands with unique structural characteristics. It will be necessary to develop special silvicultural interventions to deal with the following situations:

   - Riparian management zone constraints.
   - Riparian reserve zone constraints.
   - Structurally complex stands (multi-layer, multi-species).
   - Developmentally advanced pre-'87 stands.
   - Habitat feature preservation/preservation requirements.
   - Recreational value constraints.
   - Special timber value constraints.

   Innovative tactical planning will require the development and evaluation of prototype treatment prescriptions, and establishment of pilot demonstration areas to facilitate technology transfer to operational staff. This tactic should be initiated during the summer of 2000, 2001 and 2002 in order to provide recommendations for operational practice as soon as possible.

This tactic is a research and development component of the impeded stand intervention strategy. A annual commitment of $40 000, or 2% of the pre-'87 investments should be allocated to tactical planning.

2. Pre-'87 Operational Planning

It is essential that operational planning for the Pre-'87 backlog program (of which stand interventions forms the largest component) resumes in 2000/2001 to ensure that budget resources match program needs, and that silvicultural investments reflect the best tactics and most cost efficient investments.

Recommended Tactical Components:

Four components constitute operational planning:

Database and map maintenance and update

Annual plan preparation

Surveys/data collection (free-growing, survival, stocking, stand tending)

Pesticide Use Permit Applications

Operational planning project requirements for 2000/2001 are $100 000. This represents approximately 5% of the proposed brushing project investment for 2000/2001, and will generate approximately 90 person-days of direct silvicultural employment, largely in surveys and planning. Without a comprehensive operational plan, the success of this major investment will be jeopardized. Subsequent annual funding requirements for Operational Planning are $200 000.

3. Impeded Stand Interventions

It has been assumed that approximately 50 000 ha of pre-'87 impeded stands require tactical interventions aimed at increasing timber production potential. As these impeded stands develop, opportunities that now exist to improve production will be foregone. For instance, some stands will be close to 50 years old within 20 years. At this stand age potentially greater, more cost effective gains may be made through stand liquidation and re-establishment, rather than by release treatments.

Because of this age-dependency, a more reasonable working target would be treatment of approximately 25 000 ha over the next decade. Achieving this target will therefore require an operational capacity to treat approximately 2 500 ha annually for 10 years.

Figure 3-11 illustrates the considerable range of intervention costs between several options. Manual or motor-manual intervention costs are highly variable, but considerably more costly ($800-$1 400/ha) than most

other options. Aerial, broadcast herbicide interventions, for example, cost in the range of $450-500/ha in the Mackenzie Forest District. Ground, broadcast interventions cost approximately $1 200/ha, although the range of cost is extreme ($800-$1 900/ha). Cost estimates for girdling treatments are sparse and dated, however costs likely fall within the range for manual/motor-manual treatments.

Despite the cost differential, two aspects of manual treatment options are favored in the TSA. Manual intervention tactics usually create greater, immediate employment opportunities for local workers than do capital and equipment intensive aerial herbicide options, and require much less planning support than do options requiring permit administration. The resulting emphasis on these options may have lead to their over-use during previous years. For example, since 1980, 8800 ha have been treated using manual/motor-manual tactics compared to 6300 ha of aerial herbicide applications; a ratio of 60:40.

In order to maximize the achievement of impeded stand treatments, approximately 75% of all stands should be treated using the aerial herbicide tactic. This should increase program achievement by approximately 25% each year. The resulting cost effectiveness is an extremely important tactical goal during a time of fiscal constraint in silvicultural expenditures.

All other tactical option (ground applied chemical or manual treatments), amounting to approximately 25% of the strategic investment will ensure flexibility in sensitive sites, as well as recognition of the importance of local forest worker job stability.

Apart from brushing tactics, another option with at least potential for reducing the minimum harvest age of specific types of pre-'87 stands (i.e. pure lodgepole pine) is pre-commercial thinning interventions. It is unlikely, however, that the strategic value of this tactic will be as great as that of brushing treatments. For this reason, pre-commercial thinning should be de-emphasized as an investment, until such time as forest estate analyses determine it has key strategic importance.

Pre-commercial thinning is a costly, labour intensive intervention. Unit costs are currently up to $1 200/ha in the TSA. While it offers excellent forest worker job opportunities, there is much greater uncertainty regarding its biological efficacy compared to brushing. For this reason, where pre-commercial thinning is selected for reasons of job creation, it is recommended that manual brushing should be substituted wherever possible to maximize the strategic value of the investment. Manual brushing is equally as labour intensive, but with a much less uncertain strategic and biological outcome.

Recommended Intervention Tactics:

Aerial Herbicide Interventions

An annual working target of 1875 ha of aerial herbicide brushing is required to implement Pre-'87 Impeded Stand Intervention Strategy. This maximize the implementation rate of the strategy, and is well within the operational capability of stake holders and contractors. Approximately 38 person-days of direct employment will be generated, primarily in layout and supervision.

Manual Brushing Interventions

An annual working target of 625 ha of manual brushing (including ground based chemical, and all forms of manual/motor-manual) is required to implement the Pre-'87 Impeded Stand Intervention Strategy. This tactic will generate approximately 1875 person-days of employment, primarily in forest worker wages.

5.9.3 Strategy 3 - Accelerated Reforestation

Recommended Tactics:

1. Current Reforestation (Fire and Pest Disturbance)

   Greater strategic gains will be possible by accelerating the current reforestation program due to the large potential scale of operations, and greater strategic impact. Investments for 2000/2001 should focus on two tactics:

   1. *Operational Planning* - a comprehensive operational plan is required to direct future operations. This will require $150 000 in the first year, with an annual investment of $15 000 in each succeeding year over the next five years. Investments in surveys, prescriptions and planning in year 1 will increase the efficiency and effectiveness of reforestation projects in future years.
   2. *Planting Operations*- a modest sized planting project is required in 2000, requiring approximately $150 000.

2. Pre-`87 Reforestation

   The efficiency and effectiveness of this tactic is declining in proportion to the area requiring reforestation (largely fill-planting). Pre-`87 NSR should therefore be phased out as a tactic over the next two years. During that time only those projects which have been initiated, and constitute legal obligations will be implemented. Beginning in 2002, emphasis will be transferred to the Current Reforestation Program.
   During 2000/2001, five inter-related tactical components contribute to the pre-`87 reforestation tactic:

   1. *Operational Planning* – surveys, prescriptions and planning is required to support the final year of reforestation activities in 2001. This requires a commitment of $25 000 in 2000.
   2. *Site Preparation* – chemical site preparation is required on 100 ha to prepare planting sites scheduled for 2001 reforestation. This requires a commitment of $80 000. No further site preparation is planned in subsequent years.
   3. *Seedling Purchases*- partial payments for planting stock to be planted in 2000 and 2001 will require a commitment of $60 000. Final payments for 2001 stock will require a further commitment of $30 000.
   4. *Planting Operations* – planting of 350 ha is scheduled in 2000, and 150 ha is scheduled for 2001. This requires a commitment of $245 000 in 2000, and $105 000 in 2001.
   5. *Brushing* – brushing commitments on previously reforested pre-`87 sites over the past several years. In 2000 a total of 500

ha require chemical brushing treatments (aerial and ground herbicide) to protect the reforestation investment. A similar level of brushing is required in 2001. This requires a commitment of $400 000 each year.

5.9.4 Strategy 4 – Pest Management Detection and Interventions

Recommended Tactics:

Three inter-related tactics contribute to implementing the pest management strategy:

1. **Pest Management Planning**

   The pest management program plays a key role in sustaining the medium and long term supply of timber in the TSA. Development of flexible strategic, tactical and operational plans is essential for dealing with the dynamics of epidemic pest populations. These plans could be utilized in Landscape Unit Planning and provide direction for an integrated pest management program in the TSA. Investments committed to this end in 1998 are expected to provide a pest management plan for 2000/2001. It may, however, be necessary to commit additional funds in subsequent years.

2. **Pest Management Operations:**

   During 2000/2001, four inter-related tactical components contribute to the pest management strategy:

   1. *Ground Surveys* – an annual commitment of $52 000 is required to survey 3500 ha.
   2. *Aerial Surveys* – an annual commitment of $80 000 is required to survey 80 mapsheets.
   3. *Fall and Burn Treatments* – an annual commitment of $25 000 is required to treat 250 trees
   4. *MSMA Treatments* – an annual commitment of $25 000 is required to treat 250 trees.

3. **Research and Development**
   A better understanding is needed of the population dynamics and host interactions of the spruce budworm. An annual commitment of $5 000 is required to complete monitoring and sampling of an on-going study in the TSA.

5.9.5 Strategy 5 – Achievement of Basic Silviculture Performance

Recommended Tactics:

This strategy is, by default, implemented by the Ministry of Forests and Forest Licencees in the TSA. Further details are beyond the scope of this RMP.

5.9.6 Strategy 6 – Increasing Regenerated Stand Volume

Recommended Tactics:

Three inter-related tactics contribute to implementing this strategy:

1. **Validation of Stand Productivity Potential**

   This tactic consists of two initiates aimed at correctly estimating the actual site productivity potential of stands in the TSA. An on-going project administered by Donahue Forest Products Ltd. is due to be completed in three years. It consists of new permanent sample plot installations, and Site Index Biogeoclimatic Ecosystem Classification (SIBEC) plot sampling.

   A second tactic, initiated by the Ministry of Forests, is a spruce growth intercept validation project. Sampling will take place in the Mackenzie TSA (others) for the purpose of resolving potential over-estimates of site productivity potential using the standard intercept methodology.

2. **Stand Fertilization Tactical Planning**

   Fertilization may present a biological opportunity to increase the timber production of regenerated stands, as well potentially reduce their minimum harvest age. While fertilization has not been undertaken in the TSA since 1988, future analyses may indicate this tactic is a key strategy. It will be necessary to develop a comprehensive tactical plan before fertilization operations could begin. Fertilization opportunities should be explored via a problem analysis aimed at identifying which species and stand types offer the best strategic benefits from fertilizer applications. An annual funding commitment of $25 000 is required for fertilization tactical studies.

3. **Pine Stem Rust Tactical Planning**

   Lodgepole stem rust damage may be addressable through silvicultural interventions. Locally developed tactics must be developed to minimize the impact of these diseases. Three information gaps which must be addressed are:

   - What is the volume growth impact of low, moderate and high infection levels of each rust species. This question will require an integrated pathology/growth modeling solution.
   - What is the relationship between local geography and rust infection risk. Pine rust hazard mapping will improve the efficiency with which problem stands are identified, surveyed and treated.
   - What level of lethal infection can be tolerated when density management interventions are planned for a stand. Expert examination of medium/high incidence is

a crucial pre-requisite to correct interpretation and stand prescription. The biological performance, and hence the silvicultural investment return depends on the selection of appropriate treatment measures.

An annual funding commitment of $25 000 is required for stem rust tactical studies.

5.9.7 Strategy 7 – Increasing Timber Harvesting Landbase

Three related tactics capable of contributing to this strategy are:

- Aforestation of NCBr cover types
- Aforestation of NCC stand types
- Landing Rehabilitation

At the present time none of these tactics are recommended, as explained in sections 5.5 and 5.8.

Tactical Ranking Table, Mackenzie TSA

Tactics	Strategy	Opp. Area (ha/yr)	Timber Supply Effects*			Direct Silv. Jobs Days/ha	Direct Cost $/ha	Rank **
			Short	Med.	Long			
Strategic Analysis	1	TSA	indirect	indirect	indirect			1/1
Pre-'87 Tactical Planning	2	TSA	indirect	indirect	indirect			2/3
Pre-'87 Operational Planning	2	2 500	indirect	indirect	indirect	0.04	33	2/1
Aerial herbicide tactics	2	1 875	+++	++	0	0.02	500	2/2
Manual tactics	2	625	+++	++	0	3	1 000	2/4
Precommercial thinning	2	minimize	?	?	?	3	1 000	2/5
Current Refor. – Ops. Planning	3	10 000	0	0	++	0.04	15	3/1
Current Refor. – Planting Ops.	3	300	0	0	++	2	500	3/3
Pre-'87 Refor. – Ops. Planning	3	650	0	0	+	0.04	38	3/2
Pre-'87 Refor. – Site Prep.	3	100	0	0	+	1	800	3/6
Pre-'87 Refor. – Planting Stock	3	350	0	0	+	-	170	3/7
Pre-'87 Refor. – Planting Ops.	3	350	0	0	+	3	700	3/5
Pre-'87 Refor. – Brushing	3	500	0	0	+	0.04	800	3/4
Pest Management Planning	4	TSA	0	+	++	-	0	4/1
Pest Management Operations	4	TSA	0	+	++	-	0.17	4/2
Pest Management R&D	4	-	-	-	-	-	0.005	4/3
Validation of Prod. Potential	6	TSA	0	0	++	-	-	5/1
Fertilization Tactical Planning	6	TSA	0	0	++	-	-	5/3
Stem Rust Tactical Planning	6	TSA	0	0	++	-	-	5/2
NCBr Reforestation	7	-	0	0	+	-	-	N.R.
NCC Conversion	7	-	0	0	+	-	-	N.R.
Road & Landing Rehabilitation	7	-	0	0	+	-	-	N.R.

* +++ - high; ++ - medium; + low; 0 – no effect

** 1/1 – strategy 1/first priority

N.R. Not recommended

5.10 Job Outcomes

Immediate, short term job outcomes resulting from direct silvicultural employment may be estimated by estimates contained in the Tactic Ranking table. Future timber resource jobs resulting from fluctuations in timber supply as a result of specific tactics are beyond the scope of this RMP. Completion of a strategic analysis, in connection with the 1999 Timber Supply Review may provide this employment projection.

5.11 DMK Standard RMP Summary Tables

5.11.1 Backlog Activities (Table A)

	Plan Goals (hectares)					2000/01		
	2000/2001	2001/02	2002/03	2003/04	2004/05	Funding ($000)	Average Unit Cost $	Priority[1]
Legal Obligations								
Operational Planning/surveys/prescriptions	650	-	-	-	-	25	38	1
Site preparation	100	-	-	-	-	80	800	2
Planting	350	150	-	-	-	245	700	1
Brushing	500	500	-	-	-	400	800	1
Seed Purchase[2]	350	150				60	171	2
Backlog Reforestation[3]								
Operational Planning/surveys/prescriptions	-	-	-	-	-	-	-	-
Site preparation	-	-	-	-	-	-	-	-
Site Restoration Road/land. rehab	-	-	-	-	-	-	-	-
Planting	-	-	-	-	-	-	-	-
Brushing	-	-	-	-	-	-	-	-
Seed Purchase[2]	-	-	-	-	-	-	-	-
Impeded areas								
Strategic Planning	$75 000	$20 000	$20 000	$20 000	$20 000	75	-	1
Tactical Planning	$40 000	$40 000	$40 000	$40 000	$40 000	40	-	2
Operational Planning/surveys/prescriptions	2 500	5 000	5 000	5 000	5 000	75	30	1
Site preparation	-	-	-	-	-	-	-	-
Planting	-	-	-	-	-	-	-	-
Brushing – Aerial	1 500	1 500	1 875	1 875	1 875	750	500	2
Brushing - Manual	500	500	625	625	625	500	1 000	3
Seed Purchase[2]	-	-	-	-	-	-	-	-
Backlog Activities - Management Unit Total								
Operational Planning/surveys/prescriptions	3 150	5 000	5 000	-	-	100	32	1
Site preparation	100	-				80	800	3
Planting	350	150				245		3
Brushing	2500	2 500	2 500	2 500	2 500	1 650	660	2
Seed Purchase[1]	350	150				60	171	4
Studies[4] Strateg. Planning Tactical Planning	 $75 000 $40 000	 $75 000 $40 000	 $75 000 $40 000	 $75 000 $40 000	 $75 000 $40 000	 $75 000 $40 000	 - -	 1 2

Notes:

Priority rating: Rate High=1&2, Medium=3, Low=4&5

Seed and Stock Purchase includes purchase of A class seed and cone collection, and nursery production and shipping costs.

Include opportunities for fill planting, rehabilitation of poorly performing stands and any site rehabilitation, planting and brushing activities on roads and landings that are proposed to be restored under site restoration under the Sustainable Harvest Program.

Include specific studies that need to be done to support this program area. Clearly identify in the RMP the type of study and realistic funding needs for 2000/2001. Indicate the level of funding required for subsequent years to continue these projects (where necessary) and add new projects.

5.11.2 Stand Tending Activities (Table B)

	Plan Goals (hectares)					2000/01		
	2000/2001	2001/02	2002/03	2003/04	2004/05	Funding ($000)	Average Unit Cost $	Priority[1]
Operational Planning/Surveys/prescriptions								
Spacing	50	50	50	50	50	50	1 000	3
Pruning	-	-	-	-	-	-	-	-
Fertilizing	-	-	-	-	-	-	-	-
Studies[2] Tactical Planning:								
Fertilization	$25 000	$25 000	$25 000	$25 000	$25 000	$25 000	-	1
Pine Stem Rusts	$25 000	$25 000	$25 000	$25 000	$25 000	$25 000	-	2

Notes:

Priority rating: Rate High=1&2, Medium=3, Low=4&5. Priorities relate to meeting management objectives, timber supply/timber quality targets, and strategies for the management unit.

Include specific studies that need to be done to support this program area. Clearly identify in the RMP the type of study and realistic funding needs for 2000/2001. Indicate the level of funding required for subsequent years to continue these projects where necessary and add new projects.

5.11.3 Forest Health Enhancement Activities (Table C)

	Plan Goals (hectares)					2000/01		
	2000/2001	2001/02	2002/03	2003/04	2004/05	Funding ($000)	Average Unit Cost $	Priority[1]
Site rehab	-	-	-	-	-	-	-	-
Spacing	-	-	-	-	-	-	-	-
Pruning	-	-	-	-	-	-	-	-
Studies[2] Tactical Planning: Pine Stem Rusts	$25 000	$25 000	$25 000	$25 000	$25 000	$25 000	-	1
Others[3]								

Activities included in Table C are aimed at enhancing the values of second growth stands.

To be eligible for FRBC funding, forest health enhancement activities must be consistent with two key strategic objectives:

increasing productivity and value of second growth forests; and
strengthening information for planning.

Key questions to ask with regards to forest health enhancement activities include:
will it *enhance* growth and yield?
will it *improve* our forest management practices through the gathering and sharing of better research and inventory information?
will it *promote* further understanding that will provide a sound basis for changes in practices?

Notes:
Priority rating: Rate High=1&2, Medium=3, Low=4&5

Include specific studies that need to be done to support this program area. Clearly identify in the RMP the type of study and realistic funding needs for 2000/2001. Indicate the level of funding required for subsequent years to continue these projects (where necessary) and add new projects.

Districts to define "other." Only treatments that enhance the health, volume or value of **second growth** forests are to be included.

5.11.4 Forest Health Maintenance Activities (Table D)

	Plan Goals					2000/01		
	2000/2001	2001/02	2002/03	2003/04	2004/05	Funding ($000)	Average Unit Cost $	Priority[1]
Ground Surveys (ha)	3 500	3 500	3 500	3 500	3 500	52	19.50	2
Aerial Surveys (hours of flying time)	100	100	100	100	100	80	800	1
Fall and burn treatment (trees)	250	250	250	250	250	25	100	2
MSMA treatment (trees)	250	250	250	250	250	25	100	2
Pheromone baiting (trees)	-	-	-	-	-	-	-	-
Defoliator spraying (ha)	-	-	-	-	-	-	-	-
Studies Spruce Budworm Project (plots)	25	25	25	25	25	5	200/plot	3
Other[2]								

Activities included in Table D are primarily aimed at protecting mature timber from insects and disease (primarily the control of bark beetles and defoliators).

Even though FRBC may not fund these activities, the RMP is collecting information to identify and present funding opportunities and needs to the MoF executive.

Notes:
Priority rating: Rate High=1&2, Medium=3, Low=4&5

Include specific studies that need to be done to support this program area. Clearly identify in the RMP the type of study and realistic funding needs for 2000/2001. Indicate the level of funding required for subsequent years to continue these projects (where necessary) and add new projects.

Districts to define "other" treatments that are included.

5.11.5 Current Fire and Pest Activities (Table E)

	Plan Goals (hectares)					2000/01		
	2000/2001	2001/02	2002/03	2003/04	2004/05	Funding ($000)	Average Unit Cost $	Priority[1]
Planning/surveys/prescriptions	10 000	1 000	1 000	1 000	1 000	150	15	1
Site preparation	-	-	-	-	-	-	-	-
Planting	300	300	500	300	-	150	500	3
Brushing	-	-	1 000	500	500	-	500	4
Max density spacing	-	-	-	500	300	-	-	3
Studies[2]	-	-	-	-	-	-	-	-

Activities included in Table E are primarily aimed at reforesting areas impacted by current fire and pest denudation.

Even though FRBC may not fund these activities, the RMP provides funding needs and opportunities to the MoF executive.

Notes:
Priority rating: Rate High=1&2, Medium=3, Low=4&5

Include specific studies that need to be done to support this program area. Clearly identify in the RMP the type of study and realistic funding needs for 2000/2001. Indicate the level of funding required for subsequent years.

6 Dawson Creek Forest District

6.1 Basic data

Land area	Gross district area: 2.9 M ha Gross TSA area: 2.3 M ha THLB (TSA): 811,662 ha TSA Coniferous landbase: 539,773 ha TSA Deciduous landbase: 271,889 ha
AAC (m3/yr) for TSA 41	1,733,033 m3/yr Conifer leading: 846,533 m3/yr *including 100,000 m3/yr of small (height class 2) pine* Deciduous leading: 886,500 m3/yr
Current harvest forecast:	Conifer: LTHL stable @ 972,000 m3/yr over 250 years Deciduous: Initial harvest level of 885,500 m3/yr followed by a 22% decline per decade for 2 decades and LTHL of 480,000 m3/yr
Site class profile:	Conifer landbase: Majority (47%) of THLB represented by SI 15, and (33%) by SI 10 Deciduous landbase: Majority (46%) of THLB represented by SI 20, and (42%) by SI 15
Age class profile:	Conifer: FIP data indicate majority of THLB and volume in age classes 6 and 8 (i.e., mature spruce and balsam), and also age class 5 (i.e., mature pine) Deciduous: FIP data indicate majority of THLB and volume in age class 5, and also in age classes 4 and 6 (i.e., mature and overmature aspen and cottonwood)
Species profile: (% of THLB) *Accuracy of inventory data questionable (i.e., stand types roughly only 30% reliable)*	Principal coniferous species are lodgepole pine and white spruce, with a component of subalpine fir. The major deciduous species are aspen and cottonwood. Pine leading stands represent 25% Spruce leading stands represent 22% Balsam leading stands represent <1% Aspen leading stands represent 20% Cottonwood leading stands represent 5% Mixedwood stands represent 18%
NC Brush	FIP data indicate 270 ha (<1%) of THLB in NC Brush (low/medium pine sites)
NP	FIP data indicate 190 ha (<1%) of THLB in NP (no typing available), and an additional 40 ha THLB on low/medium spruce sites and 50 ha THLB on medium birch sites

6.2 Issues

Recent compilations indicate there are 22,000 and 12,000 hectares of NSR area on the TFL and TSA landbases, respectively, which means that the key issue in the Dawson Creek Forest District is primarily that of ensuring establishment of adequate numbers of commercial conifer and deciduous tree species. Use of herbicides to facilitate conifer crop establishment and to release conifers from brush competition is essential. Backlog NSR areas must be fully stocked in accordance with TSR assumptions. Acceptance of deciduous stocking on some backlog areas will positively affect deciduous wood supply in the long term.

6.3 Incremental Silviculture History

Incremental activities have not been undertaken in any significant way due to the amount of NSR areas which require treatment.

6.4 Opportunities to Increase Timber Supply

No analyses have been undertaken at this time.

6.5 Potential Treatments and Treatable Area Information

Treatments which focus on crop establishment and maintenance must be the priority for silviculture investments. These include site preparation and planting of previously disturbed areas, fill planting to ensure full stocking of conifer plantations; chemical, sheep and manual brushing to ensure crop tree establishment, and surveys. Backlog Silviculture Prescriptions, Treatment Prescriptions, Pesticide Management Plans and Detailed Site Assessments will all have to be prepared to authorize the activities. As the amount of area considered to be NSR within the TSA and the TFL is significant and these areas are counting towards the coniferous AAC in those units, they are top priority for treatment.

6.6 Potential Strategies by Response Time Frame

6.6.1 Short Term:

Short-term strategies are to invest significantly in crop establishment and on impeded stands to ensure all areas are producing commercially acceptable tree species. Improvements need to be made in inventories and specifically site index determinations (SIBEC) by forest type and for complex (i.e., mixed) stands to ensure AAC computations accurately reflect the growing stock. Acceptance of quality deciduous growing stock on conifer disturbance areas will serve to reduce backlog investment costs in the short term

6.6.2 Medium Term:

As there is currently no predicted falldown in coniferous wood supply while there is a predicted falldown in deciduous supply, the acceptance of existing deciduous stocking on previous conifer disturbances will alleviate the deciduous supply issue to some degree.

6.6.3 Long Term:

Management regimes should reflect the species best suited for growth on particular sites regardless of the existing stocking and species. Strategies for treatment should not be as tightly constrained by a deciduous/coniferous landbase designation but should be focussed on site capacity.

6.7 Opportunities to Improve Timber Quality

Not applicable

6.8 Potential Treatments

6.9 Potential Strategies by Response Time Frame

6.9.1 Short Term:

6.9.2 Medium Term:

6.9.3 Long Term:

6.10 Timber Quality Forecast Scenarios

6.11 Habitat Supply

6.11.1 Specific issues:

There are no specific plans for enhancing habitat at this time.

6.11.2 Opportunities to mitigate:

6.11.3 Geographic areas:

6.11.4 Opportunities within existing strategies and guidelines:

6.12 Working Targets

The target for silviculture activities is to restock all NSR areas and treat impeded stands to achieve free growing stands on all areas identified as NSR in the Timber Supply Review. The objective is to achieve this within the next 10 years. Timeframe assumptions for treatment of NSR in the TSR will need to be extended.

6.13 Incremental Silviculture Program

There is no proposed incremental silviculture program at this time

6.14 Job Outcomes

Considerable numbers of jobs are created by planting and manual brushing activities.

6.15 DDC Standard RMP Summary Tables

6.15.1 Backlog Activities (Table A)

	Plan Goals (hectares)					2000/01		
	2000/2001	2001/02	2002/03	2003/04	2004/05	Funding ($000)	Average Unit Cost $	Priority[1]
Legal Obligations *5								
Planning/surveys/prescriptions	400	400	400	400	400	12	30	1
Site preparation	100	100	100	100	100	75	750	1
Planting	800	100	100	100	100	432	540	1
Brushing	500	468	100	100	100	165	330	1
Seed Purchase[2]	100	100	100	100	100	45	450	1
Backlog Reforestation[3]								
Planning/surveys/prescriptions	18806	18806	18806	18806	18806	564	30	1
Site preparation	987	987	987	987	987	740	750	
Site Restoration Road/land. rehab								
Planting	1383	1383	1383	1383	1383	553	400	1
Brushing								
Seed Purchase[2]	1500	1500	1500	1500	1500	375	250	1
Impeded areas								
Planning/surveys/prescriptions								
Site preparation								
Planting								
Brushing	2662	2662	2662	2662	2662	1299	488	1
Seed Purchase[2]								
Backlog Activities – Management Unit Total								
Planning/surveys/prescriptions	19206	19206	19206	19206	19206	576	30	1
Site preparation	1087	1087	1087	1087	1087	815	750	1
Planting	2083	2083	2083	2083	2083	931	447	1
Brushing	3162	3162	3162	3162	3162	1464	463	1
Seed Purchase[1]	1600	1600	1600	1600	1600	420	263	1
Studies[4]								

Notes:

Priority rating: Rate High=1&2, Medium=3, Low=4&5

Seed Purchase includes purchase of A class seed and cone collection.

Include opportunities for fill planting, rehabilitation of poorly performing stands and any site rehabilitation, planting and brushing activities on roads and landings that are proposed to be restored under site restoration under the Sustainable Harvest Program.

Include specific studies that need to be done to support this program area. Clearly identify in the RMP the type of study and realistic funding needs for 2000/2001. Indicate the level of funding required for subsequent years to continue these projects (where necessary) and add new projects.

Rice Property activities of planting and brushing are entered in this table because although they are not backlog activities, they are authorized under a backlog silviculture prescription. There are no seedling purchase costs because they were acquired prior to the year 2000/2001. Activities included are only those authorized under the approved silviculture prescription. Proposed age class 2 treatment areas are not included.

6.15.2 Stand Tending Activities (Table B)

	Plan Goals (hectares)					2000/01		
	2000/ 2001	2001/02	2002/03	2003/04	2004/05	Funding ($000)	Average Unit Cost $	Priority[1]
Planning/Surveys/prescriptions								
Spacing								
Pruning								
Fertilizing								
Studies[2]								

Notes:

Priority rating: Rate High=1&2, Medium=3, Low=4&5. Priorities relate to meeting management objectives, timber supply/timber quality targets, and strategies for the management unit.

Include specific studies that need to be done to support this program area. Clearly identify in the RMP the type of study and realistic funding needs for 2000/2001. Indicate the level of funding required for subsequent years to continue these projects where necessary and add new projects.

6.15.3 Forest Health Enhancement Activities (Table C)

	Plan Goals (hectares)					2000/01		
	2000/ 2001	2001/02	2002/03	2003/04	2004/05	Funding ($000)	Average Unit Cost $	Priority[1]
Site rehab								
Spacing								
Pruning								
Studies[2]								
Others[3]								

Activities included in Table C are aimed at enhancing the values of second growth stands.

To be eligible for FRBC funding, forest health enhancement activities must be consistent with two key strategic objectives:

increasing productivity and value of second growth forests; and
strengthening information for planning.

Key questions to ask with regards to forest health enhancement activities include:
will it *enhance* growth and yield?
will it *improve* our forest management practices through the gathering and sharing of better research and inventory information?
will it *promote* further understanding that will provide a sound basis for changes in practices?

Notes:
Priority rating: Rate High=1&2, Medium=3, Low=4&5

Include specific studies that need to be done to support this program area. Clearly identify in the RMP the type of study and realistic funding needs for 2000/2001. Indicate the level of funding required for subsequent years to continue these projects (where necessary) and add new projects.

Districts to define "other." Only treatments that enhance the health, volume or value of **second growth** forests are to be included.

6.15.4 Forest Health Maintenance Activities (Table D)

	Plan Goals					2000/01		
	2000/2001	2001/02	2002/03	2003/04	2004/05	Funding ($000)	Average Unit Cost $	Priority[1]
Ground Surveys (ha)								
Aerial Surveys (hours of flying time)	15	15	15	15	15	10.5	700	2
Fall and burn treatment (trees)								
MSMA treatment (trees)								
Pheromone baiting (trees)								
Defoliator spraying (ha)								
Studies[2]								
Other[3]								

Activities included in Table D are primarily aimed at protecting mature timber from insects and disease (primarily the control of bark beetles and defoliators).

Even though FRBC may not fund these activities, the RMP is collecting information to identify and present funding opportunities and needs to the MoF executive.

Notes:

Priority rating: Rate High=1&2, Medium=3, Low=4&5

Include specific studies that need to be done to support this program area. Clearly identify in the RMP the type of study and realistic funding needs for 2000/2001. Indicate the level of funding required for subsequent years to continue these projects (where necessary) and add new projects.

Districts to define "other" treatments that are included.

6.15.5 Current Fire and Pest Activities (Table E)

	Plan Goals (hectares)					2000/01		
	2000/2001	2001/02	2002/03	2003/04	2004/05	Funding ($000)	Average Unit Cost $	Priority[1]
Planning/surveys/prescriptions	1875					56	30	1
Site preparation	435					283	650	3
Planting	350					190	540	1
Brushing	200					98	488	3
Max density spacing	70					70	1000	3
Studies[2]								

Activities included in Table E are primarily aimed at reforesting areas impacted by current fire and pest denudation.

Even though FRBC may not fund these activities, the RMP provides funding needs and opportunities to the MoF executive.

Notes:
Priority rating: Rate High=1&2, Medium=3, Low=4&5

Include specific studies that need to be done to support this program area. Clearly identify in the RMP the type of study and realistic funding needs for 2000/2001. Indicate the level of funding required for subsequent years.

6.15.6 Habitat Supply Activities (Table F)

(Footnote Domestic Range)

	Plan Goals (hectares)					2000/01		
	2000/2001	2001/02	2002/03	2003/04	2004/05	Funding ($000)	Average Unit Cost $	Priority[1]
Planning/surveys/prescriptions								
Site preparation								
Planting								
Brushing								
Spacing								
Pruning								
Studies[2]								
Others[3]								

FRBC may fund habitat enhancement and domestic range management activities such as: planting of Riparian Management Zones (and Riparian Reserve Zones under the Watershed Restoration Program) with hardwoods; spacing to produce mule deer winter habitat; spacing to control tree densities on range land; or pruning to maintain forage conditions.

Even though FRBC may not fund all these activities, the RMP process is collecting complete information to identify and present funding opportunities and needs.

Notes:

Priority rating: Rate High=1&2, Medium=3, Low=4&5

Include specific studies that need to be done to support this program area. Clearly identify in the RMP the type of study and realistic funding needs for 2000/2001. Indicate the level of funding required for subsequent years.

Districts to define "other" treatments that are included. Footnote domestic range activities.

7 Fort St John Forest District

7.1 Introduction

The absence of data in the *Stand Tending* and *Forest Health Enhancement* tables as well as minimal dollars requested in the *Forest Health Maintenance* table indicates a definite level of priorization with the District.

As for the remainder of the tables, here is the rationale:

7.1.1 Backlog Activities

Legal Obligations
The amount of surveying shown is a 5 year average of the required surveys needed for follow-up on existing (and anticipated for this fiscal) obligations that have been activated (prescription written and site prep initiated).

The 350 ha of planting will cover off the site preparation done this winter.

The 200 ha of annual brushing is a combination of chemical and manual brushing that will be required on regenerated areas under prescription.

Backlog Reforestation
The 2,880 ha of surveys shown are in addition to the legal obligation. The amount is based off an ISIS query and was averaged for a balanced program. This represents half of the 5,760 ha of annual surveys. The amount of surveys was split 50/50 between backlog NSR and Impeded.

The 1,000 ha of Site Prep is the predicted amount that could be accomplished in a given fiscal year. Some of this area is already identified while the remainder is to be identified from the annual surveys.

There is no goals associated with road and landing rehabilitation. This activity is not deemed a priority at this time.

The 650 ha of planting is based on the site prepped ground (double treatment) plus some fill-planting.

Impeded Areas
See Backlog Reforestation survey comments.

The 1,815 ha of brushing is a combination of herbicide treatments and manual treatments. It is the 5 yr. average that can be expected from the existing and pending survey results.

7.1.2 Forest Health Maintenance

Minimal dollars expected to be expended here, unless of course, we find pest!

7.1.3 Current Fire and Pest

The amount of surveys was based off an ISIS query and was averaged for a balanced program.

The amount of Site Preparation is speculative at this point and is dependent on the progress of the *Nig Fire Project*. It is assumed that there will be 260 ha of double treatment (pile & burn followed by secondary site prep) to make up 520 ha annually. The extra 400 ha in the first two years is for cabling operations in preparation for max. density spacing.

The 300 ha of brushing is targeted primarily for alder and willow control on NCBr conversion sites.

There is an estimated 200 ha of max. density to be performed each year. There is an additional 200 ha per year of max. density spacing each year, starting in the 2001/2002 fiscal, that will be a follow-up treatment of the cabling operations. (note: there is only 200 ha of max. density spacing shown for the 2003/2004 fiscal that should be shown as 400 ha. Too late to change that now, but the explanation is based 400 ha not 200 ha!!!)

7.2 DJO Standard RMP Summary Tables

7.2.1 Backlog Activities (Table A)

	Plan Goals (hectares)					2000/01		
	2000/2001	2001/02	2002/03	2003/04	2004/05	Funding ($000)	Average Unit Cost $	Priority[1]
Legal Obligations								
Planning/surveys/ prescriptions	1,740	1,740	1,740	1,740	1,740	63,500	36	1
Site preparation	0	0	0	0	0	0	0	9
Planting	350	0	0	0	0	207,000	591	1
Brushing	200	200	200	200	200	80,000	400	1
Seed Purchase[2]	0	0	0	0	0	0	0	9
Backlog Reforestation[3]								
Planning/surveys/ prescriptions	2,880	2,880	2,880	2,880	2,880	105,000	36	2
Site preparation	1,000	1,000	1,000	1,000	1,000	358,000	358	2
Site Restoration Road/land. rehab	0	0	0	0	0	0	0	9
Planting	650	1,000	1,000	1,000	1,000	618,000	951	2
Brushing	0	0	0	0	0	0	0	9
Seed Purchase[2]	0	0	0	0	0	0	0	9
Impeded areas								
Planning/surveys/ prescriptions	2,880	2,880	2,880	2,880	2,880	105,000	36	2
Site preparation	0	0	0	0	0	0	0	9
Planting	0	0	0	0	0	0	0	9
Brushing	1,815	1,815	1,815	1,815	1,815	1,617,000	891	2
Seed Purchase[2]	0	0	0	0	0	0	0	9
Backlog Activities - Management Unit Total								
Planning/surveys/ prescriptions	7,500	7,500	7,500	7,500	7,500	273,500	36	
Site preparation	1,000	1,000	1,000	1,000	1,000	358,000	358	
Planting	1,000	1,000	1,000	1,000	1,000	825,000	825	
Brushing	2,015	2,015	2,015	2,015	2,015	1,697,000	842	
Seed Purchase[1]	0	0	0	0	0	0	0	
Studies[4]	0	0	0	0	0	0	0	9

Notes:

1. Priority rating: Rate High=1&2, Medium=3, Low=4&5
2. Seed Purchase includes purchase of A class seed and cone collection.
3. Include opportunities for fill planting, rehabilitation of poorly performing stands and any site rehabilitation, planting and brushing activities on roads and landings that are proposed to be restored under site restoration under the Sustainable Harvest Program.
4. Include specific studies that need to be done to support this program area. Clearly identify in the RMP the type of study and realistic funding needs for 2000/2001. Indicate the level of funding required for subsequent years to continue these projects (where necessary) and add new projects.

7.2.2 Stand Tending Activities (Table B)

	Plan Goals (hectares)					2000/01		
	2000/2001	2001/02	2002/03	2003/04	2004/05	Funding ($000)	Average Unit Cost $	Priority[1]
Planning/Surveys /prescriptions	0	0	0	0	0	0	0	9
Spacing	0	0	0	0	0	0	0	9
Pruning	0	0	0	0	0	0	0	9
Fertilizing	0	0	0	0	0	0	0	9
Studies[2]	0	0	0	0	0	0	0	9

Notes:

1. Priority rating: Rate High=1&2, Medium=3, Low=4&5. Priorities relate to meeting management objectives, timber supply/timber quality targets, and strategies for the management unit.
2. Include specific studies that need to be done to support this program area. Clearly identify in the RMP the type of study and realistic funding needs for 2000/2001. Indicate the level of funding required for subsequent years to continue these projects where necessary and add new projects.

7.2.3 Forest Health Enhancement Activities (Table C)

	Plan Goals (hectares)					2000/01		
	2000/2001	2001/02	2002/03	2003/04	2004/05	Funding ($000)	Average Unit Cost $	Priority[1]
Site rehab	0	0	0	0	0	0	0	9
Spacing	0	0	0	0	0	0	0	9
Pruning	0	0	0	0	0	0	0	9
Studies[2]	0	0	0	0	0	0	0	9
Others[3]	0	0	0	0	0	0	0	9

Activities included in Table C are aimed at enhancing the values of second growth stands.

To be eligible for FRBC funding, forest health enhancement activities must be consistent with two key strategic objectives:

1) increasing productivity and value of second growth forests; and
2) strengthening information for planning.

Key questions to ask with regards to forest health enhancement activities include:

- will it *enhance* growth and yield?
- will it *improve* our forest management practices through the gathering and sharing of better research and inventory information?
- will it *promote* further understanding that will provide a sound basis for changes in practices?

Notes:

1. Priority rating: Rate High=1&2, Medium=3, Low=4&5
2. Include specific studies that need to be done to support this program area. Clearly identify in the RMP the type of study and realistic funding needs for 2000/2001. Indicate the level of funding required for subsequent years to continue these projects (where necessary) and add new projects.
3. Districts to define "other." Only treatments that enhance the health, volume or value of **second growth** forests are to be included.

7.2.4 Forest Health Maintenance Activities (Table D)

	Plan Goals					2000/01		
	2000/2001	2001/02	2002/03	2003/04	2004/05	Funding ($000)	Average Unit Cost $	Priority[1]
Ground Surveys (ha)	0	0	0	0	0	0	0	9
Aerial Surveys (hours of flying time)	15	15	15	15	15	6,000	400	2
Fall and burn treatment (trees)	0	0	0	0	0	0	0	9
MSMA treatment (trees)	0	0	0	0	0	0	0	9
Pheromone baiting (trees)	0	0	0	0	0	0	0	9
Defoliator spraying (ha)	0	0	0	0	0	0	0	9
Studies[2]	0	0	0	0	0	0	0	9
Other[3]	0	0	0	0	0	0	0	9

Activities included in Table D are primarily aimed at protecting mature timber from insects and disease (primarily the control of bark beetles and defoliators).

Even though FRBC may not fund these activities, the RMP is collecting information to identify and present funding opportunities and needs to the MoF executive.

Notes:

1. Priority rating: Rate High=1&2, Medium=3, Low=4&5
2. Include specific studies that need to be done to support this program area. Clearly identify in the RMP the type of study and realistic funding needs for 2000/2001. Indicate the level of funding required for subsequent years to continue these projects (where necessary) and add new projects.
3. Districts to define "other" treatments that are included.

7.2.5 Current Fire and Pest Activities (Table E)

	Plan Goals (hectares)					2000/01		
	2000/2001	2001/02	2002/03	2003/04	2004/05	Funding ($000)	Average Unit Cost $	Priority[1]
Planning/surveys/ prescriptions	750	750	750	750	750	28,000	37	2
Site preparation	920	920	520	520	0	300,000	326	2
Planting	0	260	260	260	260	0	0	9
Brushing	300	300	300	300	300	170,000	567	2
Max density spacing	200	400	400	200	400	100,000	500	2
Studies[2]	0	0	0	0	0	0	0	9

Activities included in Table E are primarily aimed at reforesting areas impacted by current fire and pest denudation.

Even though FRBC may not fund these activities, the RMP provides funding needs and opportunities to the MoF executive.

Notes:

1. Priority rating: Rate High=1&2, Medium=3, Low=4&5
2. Include specific studies that need to be done to support this program area. Clearly identify in the RMP the type of study and realistic funding needs for 2000/2001. Indicate the level of funding required for subsequent years.

7.2.6 Habitat Supply Activities (Table F)

(Footnote Domestic Range)

	Plan Goals (hectares)					2000/01		
	2000/2001	2001/02	2002/03	2003/04	2004/05	Funding ($000)	Average Unit Cost $	Priority[1]
Planning/surveys/ prescriptions	0	0	0	0	0	0	0	9
Site preparation	0	0	0	0	0	0	0	9
Planting	0	0	0	0	0	0	0	9
Brushing	0	0	0	0	0	0	0	9
Spacing	0	0	0	0	0	0	0	9
Pruning	0	0	0	0	0	0	0	9
Studies[2]	0	0	0	0	0	0	0	9
Others[3]	0	0	0	0	0	0	0	9

1. FRBC may fund habitat enhancement and domestic range management activities such as: planting of Riparian Management Zones (and Riparian Reserve Zones under the Watershed Restoration Program) with hardwoods; spacing to produce mule deer winter habitat; spacing to control tree densities on range land; or pruning to maintain forage conditions.
2. Even though FRBC may not fund all these activities, the RMP process is collecting complete information to identify and present funding opportunities and needs.

Notes:

1. Priority rating: Rate High=1&2, Medium=3, Low=4&5
2. Include specific studies that need to be done to support this program area. Clearly identify in the RMP the type of study and realistic funding needs for 2000/2001. Indicate the level of funding required for subsequent years.
3. Districts to define "other" treatments that are included. Footnote domestic range activities.

A RESOURCE MANAGEMENT PLAN

FOR

FORT NELSON FOREST DISTRICT

2000 - 2004

Ministry of Forests

In Partnership with

FOREST RENEWAL BC

8 Fort Nelson Forest District

This Resource Management Plan is submitted in fulfilment of conditions and obligations in the MULTI-YEAR AGREEMENT (Services) between the Ministry of Forests and Forest Renewal BC

Prepared by: Ljiljana Knezevic

Reviewed by:

Approved by:

8.1 Introduction

The following document is a Resource Management Plan for the Fort Nelson Forest District. It examines the **five year** 'investment needs' of the forested land base in consideration of the longer term implications.
The RMP process addresses priorities of land based activities from the perspective of biological needs and forest resource management priorities. Forest Renewal BC Investment Strategy, Strategic Objectives, and Key Targets are implemented in this planning process.
This document has three components:

1. Sustainable Harvest

The Sustainable Harvest component of RMP contain resource properties for backlog reforestation, forest health maintenance, and current fire and pest funding opportunities.
High priority silviculture activities include those that :
are consistent with forest level silviculture strategies
protect forests from insect epidemics
contribute to maintaining or enhancing current harvest levels; and
minimize the anticipated interim shortfall in timber supply

Table 1 includes the list of program areas which are included in the RMP

Program	Description	Activities
Backlog Reforestation	Activities applied to backlog NSR and impeded areas with the objective of improving timber growth, yield, value and habitat supply on these sites.	Site preparation, planting, brushing and associated surveys and prescriptions.
Site Restoration	Specific silviculture activities applied to, bring land back into a productive state for timber production.	Rehabilitation and reforestation Non commercial sites
Forest Health Maintenance	Activities to protect mature timber from insects and disease (primarily the control of bark beetles and defoliators). These activities are included for MoF planning needs.	Defoliator spraying, and aerial surveys.
Current Fire and Pest	Activities to reforest and tend areas that have been denuded by current fire and pests.	Site preparation, planting, brushing, maximum density spacing, and associated surveys and prescriptions to produce free growing stands.

2) Road and Bridge Maintenance
Forest Recreation Site and Trail Maintenance
Technical Consultation report

With this document for guidance, Forest Renewal BC will be able to make better investment decisions. It will allow merging of the biological and land based needs of the natural resources with the socio-economic objectives of Forest Renewal.

RESOURCE MANAGEMENT PLAN

Sustainable Harvest Component

2001 - 2005

8.2 Basic Data

8.2.1 Land Area

The Fort Nelson Timber Supply Area is situated in the north-eastern corner of the province within the Prince George Forest Region. This TSA, administered from the Fort Nelson Forest District office in Fort Nelson, is the second largest timber supply area in the province, covering more than 8.2 million hectares. It is bordered on the east by Alberta, on the north by the Northwest and Yukon Territories, on the west by the summit of the northern Rocky Mountains and the Cassiar Forest District, and on the south by the Fort St. John and Mackenzie Forest Districts.

The eastern part of the timber supply area, nearest the Alberta border, is an extension of the Great Plains (or Alberta Plateau). In the southern part of the timber supply area, these plains grade into the foothills of the northern Rocky Mountains at the western boundary of the timber supply area. In the northern portion, the plains grade into the Liard River basin and the Liard Plateau.

About half of the Fort Nelson TSA is considered productive forest area (about 4.2 million hectares). Currently 28 per cent of that productive forest (or 14 per cent of the total TSA) is considered available for harvesting.

The main community is the town of Fort Nelson, where three-quarters of the TSA's population live. Other unincorporated communities include Prophet River, Toad River, Muncho Lake and Coal River. The Fort Nelson TSA includes Muncho Lake Park, Stone Mountain Park, Wokkpash Recreation Area and part of the Muskwa-Kechika Management Area, as well as several other small parks and recreation areas.

8.2.2 Annual Allowable Cut (AAC):

The current allowable annual cut, determined in 1994, is 1 500 000 cubic metres per year, an increase from the previous 972 000 cubic metres. This harvest is partitioned into 600 000 cubic metres per year of coniferous species and 900 000 cubic metres per year of deciduous species.

8.2.3 Site Class Profile:

As per Timber Supply Review II analysis Fort Nelson Timber Harvesting Land Base consist of:

Poor Site	35%
Medium Site	54%
Good Site	9%
Low Productive site	1%

TSRII process is nearing completion for Fort Nelson District. This process will likely identify significant inventory issues that will require addressing.

8.2.4 Age Class Profile:

Not available in this time

8.2.5 Tree Species Profile:

Fort Nelson TSA - FLB

spruce	43%
aspen	29%
cottonwood	3%
pine	20%
birch	5%

8.3 Issues

The key issues affecting timber supply are:

8.3.1 Utilization Levels

The utilization levels define the maximum stump height, maximum top diameter inside bark (dib) and minimum diameter at breast height (dbh) by species and is used in the TSR analyzes to calculate merchantable volume. Any changes in utilization standards will affect timber quantity and quality.

8.3.2 Mixedwood Management Guidelines

In the past mixed species stands have not been widely utilized in the Fort Nelson TSA. Development of coniferous and deciduous facilities in fort Nelson has recently led to increased interest in mixedwood stands. Although an interim mixedwood strategy exists for the District there is still some uncertainty about the dynamics of mixed wood stands. Silviculture stand management techniques for mixed woos stands are currently under development

8.3.3 Small Scale Salvage Program

Estimated annual losses (TSR) on total land base are 484 569m3/year (Spruce beetle, Spruce budworm and Fire). Annual salvage of losses are 58 173m3/year.
There are losses due to blowdown within some older stands in Fort Nelson TSA that need to be estimated this summer.
Improved forest health maintenance projects and increased salvage programs will could potentially increase timber supply.

8.3.4 Silviculture

Reforesting all backlog sites by the tear 2007 (TSR II assumption) and rehabilitating (convert to spruce) 2,500hectares of Non Commercial Brush over the next 10 years (TSR II assumption) could potentially influence AAC determination.
In the past, areas harvested in the Fort Nelson TSA have been regenerated with lower than optimum planting densities. Increasing planting density could potentially affect future timber quantity.

8.3.5 Integrated resource management

-Declaration of additional Visual Quality Objectives
-Changes in green up requirement
-Landscape Unit Planning

Seral stage distribution may impose timing constraints on NSR rehabilitation in landscape units with large early seral area
Inventory needs to successfully complete the planning include stream and lake classification, archaeological potential assessments
-Wildlife trees (WT) and tree patches (WTP) retention
-Exclusion of the recommended LRMP proposed protected area from timber harvest. 7 backlog blocks (314 ha) are included in the new Klua Lakes Protected Area; their treatment will be deferred until a management plan will be prepared by BC Parks

Inclusion of birch leading stands (SI>17) in AAC

All of these factors are affecting timber supply, from a timber quantity, quality and health perspective, and from a habitat supply perspective.

8.4 Incremental Silviculture History

Due to late start of harvesting in Fort Nelson TSA there is not incremental silviculture history. However reforestation of all backlog sites in 10 years and conversion of 2,500hectares of Non Commercial Brush over the next 10 years are incorporated in Timber supply Analyses.

8.5 Opportunities to Increase Timber Supply

Currently it is felt that Site Index on many aspen (At) stands may be underestimated. Many of these stands do not contribute to the THLB used in determining AAC. Future inventory projects targeting these stands will likely confirm the extent to which this issue exists. An increase in the utilisation of At along with this has the potential to increase this component of timber supply.

Furthermore, the Fort Nelson TSA has vast areas of Sb leading stands. In much of these areas the inventory is of a vintage from a time when Sb was not considered to be a merchantable species. Subsequently the typing of the stands in these areas is suspect, often lumping areas of Sb with other areas of historically less attractive stands (NP).

Refinement of the mapping of these stands and adjustment in harvesting and management practices may allow these stands to more reflectively contribute to timber supply and subsequently allow for an increase.

8.5.1 Reforest all Backlog Sites by 2007 (TSR II assumption)

As of October 1, 1987 the Ministry of Forests took over responsibility for all areas logged prior to this date. All blocks were considered part of the ministry outstanding program as there never was an industry outstanding program in this district. The Forest Service has had an aggressive and successful backlog program since this time.

The total area listed as NSR in the Fort Nelson Forest District is approximately 11,000 ha. About 2,500 ha are estimated as having regeneration problems or being subject to other constraints (Forest Practices Code, Landscape Unit Planning, etc) and will be reclassified accordingly. Of the remaining ISIS listed NSR figures, 2000-3000 ha are either known or estimated to be fully stocked but not yet confirmed by regeneration surveys. It is estimated that there are 5,000-6,000 ha of treatable backlog NSR in the Fort Nelson Forest District.

These 5,000 to 6,000 hectares of treatable area are spread out in a mosaic pattern over most of the working forest in the Fort Nelson TSA. Many blocks are partially NSR with SR sections that are essentially free growing or require brushing treatments. These blocks may be located in a river valley accessible

only in winter after an ice bridge has been built. Therefore access co-ordination has to be emphasized as one of the main driving forces in backlog rehabilitation.

It is estimated that 30% of the treatable area (1,800ha) will be mechanically site prepared and planted and the remaining 70%(4,200 ha) will be chemically site prepared and fill planted.

8.5.2 Complete Free Growing on all Backlog Sites by 2015

In 1988 the Forest Service divided the district into administration zones for backlog planning purposes. The intention at the time was to consolidate the silviculture requirements in a given administration zone and schedule activities to make best use of the access that would be put in place. For cost effective purposes, it was hoped that whole administration zones could be finished before moving onto different zones. Some zones have almost been completed and have little or no NSR hectares within them. Lowering the impact of too much site preparation or herbicide application in a given area over a too short period became an issue and the Forest Service has been spreading its backlog work over several administration zones in given year. The initial strategy should be followed in the future as it can have major cost savings associated with access requirements. It can also be modified to replace administration zones with landscape units, making backlog reforestation an intrinsic component of landscape planning.

The backlog areas are some of the most productive sites in the district, and rehabilitating them creates some of the more critical brush problems. Backlog areas require at least one brushing treatment, with most of them requiring two. Timing and type of brushing is dependent on many factors and the availability of a wide range of silvicultural tools is critical in implementing a sound management of our forests.

Many blocks are partially stocked with coniferous or deciduous species, a result of incomplete natural regeneration or plantation failure. Other fully stocked blocks are partially or completely covered with brush species which reduce or impede the growth of our desired crop species. Emphasis during the initial phase of backlog planning is in stratifying the blocks into its correct stocking status and prescribing the necessary silviculture treatments to reach free growing, not just for the NSR area, but for the entire opening.

For implementing this strategy, we have made the following assumptions:
-total area is approximately 41,000 ha (30,000 ha of SR plus 11,000 ha of NSR-ISIS report)
-25% of the area (10,250 ha) requires no treatment other than monitoring and a free growing survey

-60% of the area (24,600 ha) require one brushing treatment ; is estimated that 70%(17,220 ha) will be chemically treated and the remaining 30%(7,380 ha) will be manually brushed
-15% of the area (6,150 ha) requires two brushing treatments (70% will be chemical and 30% manual)

Slocan Forest Products Ltd. is an active participant in the backlog program. The company has prepared a backlog silviculture plan for the administration zones assigned to it two years ago and is currently completing on-the-ground activities (manual brushing, planting, etc). They have been assigned three more administration zones last year and they are finishing the planning process and prescriptions for it. Majority of the activities for next year will be in these administration zones.

This investment strategy will be subject to continuous fine-tuning as new information becomes available (i.e. release of the TSR II analysis and Chief Forester's rationale, stocking surveys results, landscape unit planning directions).

8.5.3 Stand Conversion

Rehabilitate (convert to spruce) 2,500 hectares of Non Commercial Brush over the next 10 years (TSR II assumption)

Site rehabilitation is the conversion of potentially productive land presently occupied by undesirable stands or by brush to a condition appropriate for establishing desired species. Old NCBr established after natural disturbances (fires) are perfect candidates for this. Similar treatments have been done in the past in Fort Nelson Forest District with very good results (annual increments of 70-80 cm in average for spruce), validating that NCBr conversion is one of the most effective silviculture activities for increasing the timber harvesting landbase (and associated AAC).

The intent is to follow a comprehensive plan from establishment to free-growing in order to attain the management objectives set at landscape and stand level.

8.5.4 Protection From Damaging Agents

"To ensure existing forest resources are protected from damaging agents, and that the damaging agents do not impede silviculture obligations or investments"

This will be achieved through a combination of aerial and ground surveys, forest health studies (i.e. understanding the insect complex and potential damage

associated with spruce decline), and forest health treatments (defoliator spraying).

8.5.5 Response to Silviculture Treatments in Boreal Mixedwood Stands

"To better understand and apply silviculture treatments in the boreal mixedwood"

This will involve a variety of studies focusing on silviculture systems to be used in boreal mixedwoods (i.e. ones that would ensure appropriate levels of coniferous understory protection, feasibility of summer harvesting on fine-textured soils, etc), free-growing standards and other pertinent issues.

8.6 Habitat Supply

8.6.1 Specific issues:

The Fort Nelson Timber Supply Area contains three biogeoclimatic zones, with the Boreal White and Black Spruce being the predominant one (covering about two-thirds of the TSA's land base). The next table summarizes the zones and their locations, the major tree species present, and other considerations such as climate and wildlife values.

Table 2: Biogeoclimatic Zones of the Fort Nelson Timber Supply Area

Zone	Location	Tree Species	Other
Boreal White and Black Spruce	Covers most of the eastern portion of the timber supply area, to an elevation of 1300 metres. Occupies 68% of TSA land base.	Dominant: white spruce, lodgepole pine, trembling aspen. Minor: black spruce, balsam poplar, tamarack, subalpine fir, common paper birch and Alaska paper birch.	Long, very cold winters and short growing seasons. Rich in wildlife.
Spruce Willow Birch	On middle elevations of northern Rocky Mountains and much of the Liard Plateau (1300 m to 1500 m). Occupies 19% of TSA land base.	**Lower elevations** Dominant: white spruce and subalpine fir. Minor: black spruce, lodgepole pine and trembling aspen. **Upper elevations** Dominated by tall deciduous shrubs (birch, willow species).	Harshest climate of all forested zones in BC. Winters long and cold, summers brief and cool. Major wildlife use in summer months.
Alpine Tundra	Above 1500 m. Occupies 13% of TSA land base.	Trees generally absent. Plants are small, close to ground, and often widely separated by bare soil or rock.	Harshest climate of all BC zones. Wildlife diversity and density are low.

The severe climate of the Fort Nelson TSA limits wildlife use in some isolated portions or at certain times of year. However, this TSA also contains vast tracts of relatively undeveloped land that support abundant, diverse and internationally significant wildlife populations. Large mammals such as moose, black bear, grizzly bear and Stone sheep are common, as are smaller furbearers such as wolverine, wolf, lynx, weasel, mink, river otter, beaver and coyote. Regionally significant species include mountain goat, caribou, marten, thinhorn sheep, elk, harlequin duck and northern goshawk.

The Boreal White and Black Spruce Zone has the least snowfall of all the northern BC zones and consequently is very important for wintering ungulates. Also in that zone, frequent forest fires have formed a mosaic of upland forests of different ages, providing a variety of habitats. The extensive deciduous forests frequently achieve older age classes and are important for ungulates, birds and small mammals.

Most reptiles and amphibians are ill-adapted to the northern climate and few species are present in this timber supply area. However, it is home to a unique range of bird species, many of them eastern species not otherwise found in BC. Conversely, many birds found in other parts of the province do not occur in this timber supply area. The abundant rivers, lakes, ponds and marshes provide important staging grounds during the migration of waterbirds such as pintails, widgeons, geese and teal.
Many fish species important as game are found in the waterbodies of this area. These include some trout species, whitefish, burbot, Arctic grayling, northern pike and walleye. The rare occurrence of some salmon species has also been noted in some of the major rivers. Approximately 15 game and non-game fish species occur only in this part of the province.

8.6.2 Opportunities to mitigate:

Current forest management practices follow the standards and legislation set out by the Forest Practices Code. Consequently the protection of wildlife and the environment will primarily be managed through the Code. Some inventory work and development of management guidelines is still outstanding in order to fully mitigate impacts to fish and wildlife as anticipated by the Code. Local resource managers are attempting to obtain some of these inventories and to consider environmental impacts in development planning.

The Fort Nelson Land and Resource Management Plan, approved by the provincial government in the fall of 1997, also results in changes to forest management practices that affect environmental values. These changes will be considered in this Timber Supply Review.

Overall the Land and Resource Management Plan improves the outlook for most wildlife species and their habitats. However, plant and animal species dependent on mature and old growth forests remain at moderate risk levels due to forest harvesting activities which will convert older forests to young forests. These species include furbearers (martens, the blue-listed fishers) and songbirds (various red-listed warblers). Impacts may be mitigated through more detailed, landscape level planning which is in process.

The Land and Resource Management Plan also addresses the issue of open roaded access, considered to be a potential risk factor to all ungulate species. The plan provides for co-ordinated access management strategies to mitigate this effect. However, virtually no open road access presently exists in the timber supply area as the majority of access is via winter roads developed to service the forest and oil and gas industries. The impacts of extensive seismic operations on fish and wildlife is unknown at present, but would primarily result from habitat disturbance by these linear features.

8.6.3 Geographic areas:

In the Fort Nelson TSA, about half of the land base is considered productive forest. About 72 per cent of the productive forest (or 85 per cent of the TSA) is not considered available for timber harvesting and will provide for many environmental values. Forested

area both in and outside of the timber harvesting land base will aid in the maintenance of critical forest habitats for many species

8.7 Working Targets

To reforest all backlog sites by the year 2007
To bring all backlog sites to free growing by the year 2015
"To rehabilitate (convert to spruce) 2,500 hectares of Non Commercial Brush over the next 10 years (TSR II assumption)"
"To ensure existing forest resources are protected from damaging agents, and that the damaging agents do not impede silviculture obligations or investments"
"To better understand and apply silviculture treatments in the boreal mixedwood"

8.8 Job Outcomes

This investment level is comparable with the average backlog program of the Fort Nelson Forest District over the past ten years (approx. $ 2.5 million/ year). It will maintain a stable local contracting community that already exists, while providing opportunities for new companies interested in silviculture work.

8.9 DFN Standard RMP Summary Tables

8.9.1 Backlog Activities (Table A)

	Plan Goals (hectares)					2000/01		
	2000/ 2001	2001/02	2002/03	2003/04	2004/05	Funding ($000)	Average Unit Cost $	Priority[1]
Legal Obligations								
Planning/surveys/prescriptions	300	300	300	300	300	18	60 (sur+pres.)	1
Site preparation	100(m) 70(Ch)	200	200	200	200	98	700/H(M) 400/ha(Ch)	3 1
Planting(ha)	280	280	280	280	280	224	2000st/ha/. $0.4	1
Brushing	300 Chemical	100 Chemical	280 Chemical	280 Chemical	280 Chemical	120	400/ha	1
Seed Purchase[2]	560 000	500 000	500 000	500 000	500 000	224	0.4	1
Backlog Reforestation[3]								
Planning/surveys/prescriptions	320(pres) 620(surv)	620	620	620	620	19.2 25	60/ha 40/ha	1
Site preparation	100	150	100	100	100	70	700/ha	3
Site Restoration Road/land Rehab NcBr conversion	280	280	280	280	280	196	700/ha	1
Planting	500	400	300	300	300	300	0.6/tree	3
Brushing	320Ch)	300	300	300	300	126	400/ha	1
Seed Purchase	500 000	400 000	300 000	300 000	300 000	200	0.4	3
Impeded areas								
Planning/surveys/prescriptions	5000	4000	3000	3000	3000	240	48/ha	1
Site preparation	350(ch)	400	400	400	400	140	400/ha	1
Planting	0	0	0	0	0	0	0	
Brushing	670(M) 900(Ch)	600 700	600 700	600 700	600 700	938 360	1400/ha 400/ha	1 1
Seed Purchase	0	0	0	0	0	0	0	
Backlog Activities - Management Unit Total								
Planning/surveys/prescriptions	6240	4920	3920	3920	3920	300	48/ha	1
Site preparation	900	900	700	500	500	336 168	$700X480 $400X420	1 1
Planting	780	680	580	580	580	524	$0.4X280 $0.6X500	1
Brushing	670(M) 1520(Ch)	600 700	600 700	600 700	600 700	938 608	1400 400	1 1
Seed Purchase	1,060,000	1,000,000	1,000,000	1,000,000	1,000,000	424	0.4	1
Studies[1]	1	1	1	1	1	100	100/ha	1
TOTAL						3,398		

Notes:

1. The study planned for 2000/01 is a Stand and Landscape Level Modeling in Fort Nelson TSA. It will help District to better understand same uncertainty about dynamics of mixedwood stands.

Objectives of this study are:

1)Help determine AAC for deciduous and coniferous species
2)implications of implementing biodiversity guidelines for adjacency, cut block size limits and old growth retention on harvesting patterns
3)silviculture investment required to regenerate a variety of mixed species stands
4)Help us to model sustainability of mixedwood management in the Boreal forest, and to defined an appropriate harvesting, site preparation and stand management objectives.

8.9.2 Forest Health Maintenance Activities (Table B)

	Plan Goals					2000/01		
	2000/2001	2001/02	2002/03	2003/04	2004/05	Funding ($000)	Average Unit Cost $	Priority[1]
Ground Surveys (ha)								
Aerial Surveys (hours of flying time)	35	35	35	35	35	30	860	1
Fall and burn treatment (trees)								
MSMA treatment (trees)								
Pheromone baiting (trees)								
Defoliator spraying (ha)	560	560	560	560	560	28	50	1
Studies[2]								
Other[3]								

Aerial surveys using a helicopter will be done to assess the extent of damage done by forest pests (especially defoliators and bark beetles) and direct more intensive ground surveys.

1999 overview survey showed an increased in eastern budworm defoliation to the point that warrants treatment to protect high value spruce stands. It is expected that 2000 aerial surveys will give us better information regarding the extent and location of current infestation.
Decreased funding will impact the ability to implement timely treatments and salvage operations, resulting in a great amount of valuable timber being lost.

8.9.3 Current Fire and Pest Activities (Table C)

	Plan Goals (hectares)					2000/01		
	2000/2001	2001/02	2002/03	2003/04	2004/05	Funding ($000)	Average Unit Cost $	Priority[1]
Planning/surveys/prescriptions	1500	1000	500	500	500	45	30/ha	1
Site preparation	300	100	100	100	100	210	700/ha	2
Planting	350	300	100	100	100	280	0.4/tree	1
Seedling production	700,000	600,000	200,000	200,000	200,000	280	0.4	1
Brushing	200(M) 100(Ch)	100(M) 100(Ch)	100	100	100	280 40	1400/ha 400/ha	1 1
Max density spacing	150	100	50	50	50	225	1500/ha	2
Studies[2]	0	0	0	0	0	0	0	0
TOTAL						1,360		

Notes:

1999/2000 Current Fire and Pest Activities are under way in our district. Area that will be site prepared this winter (finding allocated in 1999) is ~350ha. This area is scheduled for planting next spring.